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EPA Superfund
Record of Decision:

PATUXENT RIVER NAVAL AIR STATION
EPA ID: MD7170024536
OU 01, 02
PATUXENT RIVER, MD
02/08/2000

Record Of Decision
for
Operable Unit 1

Site 1, Fishing Point Landfill
and
Site 12, Rifle Range Landfill

Naval Air Station Paxtuxent River
Patuxent River, Maryland

Engineering Field Activity Chesapeake
Naval Facilities Engineering Command

January 2000

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Acronyms and Abbreviations

ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
BTAG	Biological Technical Assistance Group
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COMAR	Code of Maryland Regulations
COPC	chemicals of potential concern
CRDL	contract-required detection limit
DDD	dichloro diphenyl. dichloroethane
DDE	dichloro diphenyl dichloroethylene
DDT	dichloro diphenyl trichloroethane
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S Environmental Protection Agency
ERA	ecological risk assessment
ESD	Explanation of Significant Differences
FS	feasibility study
H	hazard index
H	hazard quotient
IAS	Initial Assessment Study
IR	Installation Restoration
IRI	Interim Remedial Investigation
LOAEL	lowest observed adverse effects level
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Control Implementation Plan
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
MCL	Maximum Contaminant Level
MDE	Maryland Department of the Environment
msl	mean sea level
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAEL	no observed adverse effects level
NPL	National Priorities List
O&M	operations and maintenance
OU	Operable Unit

Acronyms and Abbreviations

PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
POL	petroleum, oil, and lubricants
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PRAP	Proposed Remedial Action Plan
RAB	Restoration Advisory Board
RAO	remedial action objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RDA	recommended daily allowances
RFA	RCRA Facilities Assessment
RfD	reference dose
RI	remedial investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SDWA	Safe Drinking Water Act
SF	slope factor
SVOC	semivolatile organic compound
TAL	target analyte list
TBC	to be considered
TCL	target compound list
USC	United States Code
VOC	volatile organic compound

1.0 Declaration

1.1 Site Name and Location

This Record of Decision (ROD) addresses contaminated soil and groundwater at Sites 1 and 12 (Fishing Point and Rifle Range Landfills, and adjacent areas), located at Patuxent River Naval Air Station (NAS) in St. Mary's County, Maryland.

1.2 Statement of Basis and Purpose

This Decision Document presents the selected remedy for contaminated soil and groundwater at Sites 1 and 12, Patuxent River NAS (National Superfund Database number MD 7170024536). The selected remedy addresses Operable Unit 1 (OU-1), which comprises soil and groundwater at Site 1 and Site 12 and the surface water and sediment in the Patuxent River adjacent to the sites.

The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the Fishing Point and Rifle Range Landfill Sites.

The United States Department of the Navy (Navy) and the United States Environmental Protection Agency (EPA) Region III issue this decision document jointly. The State of Maryland concurs with the selected remedy for Fishing Point and Rifle Range Landfill Sites OU-1 (see Appendix A). Public comments are discussed in Section 3.0, "Responsiveness Summary."

1.3 Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

1.4 Description of the Selected Remedy

The selected remedy presented in this ROD addresses soil and groundwater (OU-1) at Sites 1 and 12. The remedy is part of a comprehensive environmental remediation currently being conducted under the CERCLA program. The major components of the selected remedy for OU-1 include the following:

- Installation of a soil cover over the Fishing Point Landfill (Site 1) and Rifle Range Landfill (Site 12). The soil cover will consist of a minimum of 6 inches of topsoil

overlain by a minimum of 18 inches of clean vegetative support material. Soil for the base of the soil cover will be obtained from the area east of the Fishing Point Landfill.

- Excavation and offsite disposal of construction debris from a ravine adjacent to Rifle Range Landfill.

- Shoreline stabilization on the northwest comer of the landfills to prevent erosion of the Fishing Point Landfill, protect the soil cover, and maintain access to the western beach for recreational use. Stabilization and erosion control measures will preserve habitat along the shoreline to the extent possible, and will maintain access to the western beach for recreational use.

- One-for-one mitigation of approximately 3.6 acres of emergent wetlands, eliminated or disturbed as the result of installing the soil cover over Sites 1 and 12, either onsite or elsewhere on the NAS.

- Land use restrictions to prevent future disturbance of the landfill contents at Sites 1 and 12 beneath the soil cover.

- Five-year reviews at Sites 1 and 12. Long-term monitoring will be conducted to track future contaminant migration and data will be evaluated during the 5-year site reviews.

- An operation and maintenance (O&M) plan for Sites 1 and 12 will consist of monitoring and maintenance of the stormwater management system, vegetation cover, and erosion control structures. Groundwater monitoring will be conducted using the existing onsite monitoring wells or replacement monitoring wells. Landfill gas will be collected through a passive gas collection system and vented to the atmosphere.

After completing the Feasibility Study (FS) for Sites 1 and 12, a decision was made among the Navy, EPA, and Maryland Department of the Environment (MDE) to designate the marsh area west of Site 12 as a separate OU (OU-2) from the remainder of the Fishing Point and Rifle Range Landfill Sites. The decision was made because (1) the marsh contains a different contaminated medium (sediment) than the other Fishing Point and Rifle Range Landfill sites covered under OU-1, and (2) the marsh requires further study to quantify the potential ecological risks and need for remedial action. A remedy for the marsh will be considered at a later date following the completion of an ecological study of the area.

1.5 Statutory Determinations

The remedy for Sites 1 and 12, OU-1, selected by both EPA and the Navy with State of Maryland concurrence, is protective of human health and the environment. The selected remedy complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action. For the selected remedy, MDE has granted a variance from the State of Maryland's final cover design specifications for solid waste landfill closure (COMAR 26.04.07). The variance is justified because a soil cover would prevent contact of human and ecological receptors with landfill debris as effectively as a Resource Conservation and Recovery Act (RCRA) Subtitle D cap. Additionally, there are no current or reasonable future exposure pathways to shallow groundwater for human or environmental receptors because if groundwater pumping were to occur, surface water intrusion from the Patuxent River would result in a Class III aquifer. In addition, a RCRA

Subtitle D cap would not prevent groundwater from being in direct contact with landfill waste, since the water table is primarily controlled by the water level of the Patuxent River and not by the amount of surface water infiltration. Therefore, a RCRA Subtitle D cap would not reduce risks to human health or the environment to a substantially greater extent than a soil cover. Groundwater would continue to be monitored under the selected alternative to ensure that contaminant levels do not increase significantly over current concentrations.

The selected remedy is cost effective, and it uses permanent solutions. However, because treatment of the principal threats to OU-1 was not found to be practicable, the selected remedy does not satisfy the statutory preference for treatment as a principal element. Treatment was found to be cost-prohibitive due to the large quantity of landfill material at Sites 1 and 12.

Because the selected remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted every 5 years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. The review will be consistent with Section 121(c) of CERCLA, 42 United States Code (USC) Section 9621 (c).

1.6 ROD Data Certification Checklist

Table 1-1 provides a summary of key remedy selection information contained in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for Sites 1 and 12.

TABLE 1-1
ROD Data Certification Checklist
NAS Patuxent River, Sites 1 and 12

Remedy Selection Information	Reference
Chemicals of concern and their respective concentrations	Section 2.5.3
Baseline risk represented by the chemicals of concern	Sections 2.7.1 and 2.7.2
Cleanup levels established for chemicals of concern and the basis for these levels	Sections 2.7.1 and 2.7.2
Approaches taken to address source materials constituting principal threats	Section 2.11
Current and reasonably anticipated future land use assumptions and Current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD	Sections 2.7.1 and 2.7.2
Potential land and groundwater use that will be available at the site as a result of the selected Remedy	Section 2.12.4
Estimated capital, annual O&M, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are protected	Section 2.12.3
Key factor(s) that led to selecting the remedy	Section 2.12.1

1.7 Authorizing Signatures and Support Agency Acceptance of the Remedy

This ROD represents the selection of a remedial action under CERCLA for Sites 1 and 12, OU-1. The foregoing represents the selection of a remedial action by the United States Department of the Navy and the United States Environmental Protection Agency with the concurrence of the Maryland Department of the Environment.

United States Department of the Navy

By: _____ Date: 2/9/00

Captain Paul Roberts, USN
Commanding Officer
Naval Air Station
Patuxent River, Maryland

United States Environmental Protection Agency

By: _____ Date: 2/8/00

Abraham Ferdas, Director
Hazardous Site Cleanup Division (3HS00)
U.S. Environment Protection Agency, Region III
Philadelphia, Pennsylvania

2.0 Decision Summary

2.1 Site Name, Location, and Description

This Record of Decision (ROD) presents the United States Department of the Navy's selected remedial actions for Operable Unit 1 (OU-1), which comprises soil and groundwater at Fishing Point Landfill (Site 1) and Rifle Range Landfill (Site 12) and adjacent areas at Patuxent River NAS Sites 1 and 12. The NAS is located in St. Mary's County in southern Maryland, at the confluence of the Patuxent River and Chesapeake Bay (Figure 2-1; see figures following page 2-27). Fishing Point is located in the north-central part of the NAS (Figure 2-2), along the Patuxent River, west of Harper's Creek and northwest of Cedar Point Road.

The Navy and the United States Environmental Protection Agency (EPA) are the lead agencies involved in the remedial process for Sites 1 and 12. The Maryland Department of the Environment (MDE) serves as a support agency. The National Superfund Database identification number for NAS Patuxent River is MD 7170024536. Funds required for remediating Sites 1 and 12 originate from the Environmental Restoration, Navy funds.

Site 1, Fishing Point Landfill, consists of approximately 23 acres and is located along the shoreline of the Patuxent River, west of Harper's Creek. Surface elevations at Site 1 range from mean sea level (msl) along the shoreline to 40 feet above msl at the northeastern comer of the site. Most of the northwestern half of the site is a low, flat meadow with elevations ranging between 5 and 10 feet above msl. East of this area, the land surface rises steeply to a flat, wooded area at elevations ranging between 30 and 40 feet above msl.

Site 12, the Rifle Range Landfill, consists of approximately 2.2 acres and is located immediately south of Fishing Point Landfill, between the old rifle range and Fishing Point Landfill. The site slopes towards the west with elevations up to 15 feet above msl occurring along the eastern edge of the site. Steep ridges reaching 35 feet above msl occur to the south and southeast of the site. Most of the site is between 4 feet above msl and 10 feet above msl.

For site characterization purposes, Sites 1 and 12 were divided into six areas, each with distinct physical characteristics and contaminant types and levels. The six areas are designated by the letters "A" through "F" , and are shown on Figure 2-3. Area A is a concrete rubble and reinforcing steel disposal area. Areas B and D correspond to the Fishing Point and Rifle Range landfills. Area C is comprised of surface debris in a ravine. Area E corresponds to a marsh area southwest of the fill areas. Area F is a grassy area east of the fill areas.

OU-1 consists of soil and groundwater in Areas A, B, C, D, and F and surface water and sediment in the Patuxent River adjacent to the sites. Area E is not included in this operable unit, but it will be addressed at a later date following the completion of additional ecological study in the area.

2.2 Site History and Enforcement Activities

The history of Sites 1 and 12, previous site investigations, and highlights of community participation are summarized below.

2.2.1 History of Site Activities

The unlined landfill at Site 1 was used to dispose of liquid and solid wastes generated by the base from 1960 to 1974. Wastes included petroleum, oil, and lubricant (POL) products; construction debris; sewage treatment plant sludges; paints; solvents; antifreeze solution; pesticides; miscellaneous station wastes; and residues from burning these materials. Most of the liquid wastes were deposited in the form of contaminated rags or residues in cans. Some wastes were reportedly burned in pits at the site before burial to reduce their volume. The landfill was not officially closed under State of Maryland solid waste regulations; however, a minimal soil cover was added on top of the waste materials.

Site 12 was used from the mid-1950s until 1960. Trash and construction debris were deposited at the site. The landfill was not officially closed under State of Maryland solid waste regulations; however, a minimal soil cover was added on top of the waste materials.

In 1990, approximately 6 inches of wastewater treatment plant sludge from St. Mary's County was applied to Area F, the hillside located east of Site 1, as approved by the State of Maryland.

In 1993, the northern shoreline of Fishing Point was stabilized to prevent erosion from the site. Stone breakwaters were installed to reduce the energy of waves hitting the beach, and beach fill (sand) was used to extend the beach along the downgradient edge of the landfill. The current northern beach at Fishing Point consists entirely of clean fill brought in during the beach stabilization effort and subsequent deposition resulting from the stabilizing action of the breakwaters.

2.2.2 Summary of Previous Investigations

The following summarizes the activities of previous investigations at Site 1 and Site 12. Results of the previous investigations are discussed in Section 2.5 of this ROD.

Initial Assessment Study (IAS). The first investigation of Sites 1 and 12 was the IAS conducted in 1984. The IAS included a preliminary evaluation of potentially contaminated sites at the NAS. The IAS showed that 14 sites, including Site 1, required further evaluation to verify whether a problem existed at the sites. Site 12 was not recommended for further study because of the inert nature of materials believed to be disposed there.

Confirmation Study II. A confirmation study was conducted at Site 1 in 1985. Groundwater, surface water, and sediment samples were collected.

RCRA Facilities Assessment (RFA), Revised Phase II Report. As part of the Resource Conservation and Recovery Act (RCRA) process, in 1989 a review was conducted of NAS sites where hazardous waste was managed.

Engineering Evaluation/Cost Analysis (EE/CA). In 1992, an EE/CA was prepared to evaluate interim remedial alternatives to stabilize the eroding north shoreline of the landfill.

Specifications for the Construction of Shoreline Improvements on the Chesapeake Bay and the Patuxent River. Technical specifications were prepared in 1992 for the construction of shoreline erosion control measures.

Technical Memorandum for Site Investigation at Fishing Point Landfill. Two corroded drums were opened and sampled in 1993. Soil samples were collected from around the drums. Composite samples were collected from the concrete debris along the shoreline. This Technical Memorandum is an appendix to the Interim Remedial Investigation referenced below.

Interim Remedial Investigation (IRI). The IRI was completed in 1994. Groundwater samples were collected. In addition, hydraulic conductivity tests were conducted and long-term water-level measurements were collected.

Remedial Investigation (RI), Sites 1 and 12. Additional wells were installed at Sites 1 and 12 in 1996 and 1997. Groundwater, surface water, sediment, and soil samples were collected. The investigation determined that there was potential human health risk from recreational exposure to surface water in the marsh west of Site 12. Potential ecological risk was identified from metals in marsh surface water, and from metals and pesticides in marsh sediment. The investigation also identified potential human health risk in the unlikely event that shallow drinking water wells would be installed in the narrow strip of land between the landfill and the Patuxent River.

Feasibility Study (FS), Sites 1 and 12. An FS was prepared in 1998 to: (1) provide the basis for the remedial action at Sites 1 and 12; (2) evaluate and screen remedial technologies; and (3) develop and evaluate remedial action alternatives based on a presumptive remedy for landfill sites (containment). Additional sediment and soil samples also were collected. The results of the alternatives evaluation are discussed in this ROD.

2.2.3 Summary of Enforcement Actions

No enforcement actions have been taken at Sites 1 and 12. The Navy has owned the property since the early 1940s, and has been identified as the responsible party.

On June 30,1994, NAS Patuxent River was placed on the National Priorities List (NPL). The NPL is the nationwide list, developed by EPA, which identifies sites covered under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) regulations for priority investigation and remedial action.

2.3 Community Participation

The proposed remedial action for Sites 1 and 12, described in the FS and the Proposed Remedial Action Plan (PRAP), was released to the public on November 1, 1999. The public comment period for this document was held from November 1 to November 30,1999. A public meeting was conducted on November 9, 1999 at the Frank Knox Training Center, located at NAS Patuxent River. A copy of the PRAP Notice of Availability and the transcripts of the public meeting are provided in Appendix B. During presentations to the Restoration Advisory Board (RAB) on the FS, future land use options were discussed.

The PRAP, as well as other technical documents related to Sites 1 and 12, were placed in the Administrative Record at the following libraries:

Lexington Park Public Library
1 Coral Place
Lexington Park, Maryland 20653

Patuxent River Naval Air Station Library
Cedar Point Road
Patuxent River, Maryland 20670

All public participation requirements are consistent with CERCLA sections 113 (k) (2) (B) (i-v) and 117.

2.4 Scope and Role of Response Action at Sites 1 and 12, OU-1

Site 1 and Site 12 are two of 46 Installation Restoration (IR) sites located at NAS Patuxent River. Past disposal activities at the landfills have primarily impacted soil, groundwater, and sediment in the vicinity of Sites 1 and 12.

This ROD addresses OU-1, the first of two operable units at Sites 1 and 12. OU-1 consists of contaminated soil and groundwater in Areas A, B, C, D, and F and the surface water and the sediment in the Patuxent River adjacent to the sites. Contaminated surface water and sediment in Area E (OU-2) will be addressed at a later date, following the completion of an ecological study in the area. After the investigation is completed, the Navy will propose a preferred remedy for OU-2. The response action at OU-1 is the major component of the final remedy at Sites 1 and 12 and will be consistent with any action necessary at OU-2.

A removal action was conducted in 1993 to stabilize the northern shoreline of Fishing Point, thereby preventing landfill materials from eroding into the Patuxent River. The remedial action described in this ROD will further stabilize the shoreline, in addition to covering the landfill to prevent direct exposure to landfill contents.

OU-1 is a landfill that has the basic characteristics of a municipal landfill as defined by EPA. Because municipal Landfills have similar characteristics, EPA has identified selected remedies that are usually appropriate to address risks found at municipal landfills. Presumptive remedies were developed by EPA to streamline site investigation and the selection of cleanup methods for certain categories of sites by narrowing the consideration of cleanup methods or treatment technologies or remediation approaches that have a proven track record in the Superfund program. EPA and the Navy have determined that it is appropriate to apply the presumptive remedy for municipal landfills at this OU based on the types of waste found at the site and guidance provided in the directive, *Presumptive Remedy for CERCLA Municipal Landfill Sites* (EPA 540-F-93-035, September 1993). MDE supports the presumptive remedy approach.

The selected remedy for OU-1, presented in Section 2.12, will reduce the potential risk to human health and the environment associated with surface soils and subsurface soils at Sites 1 and 12. The remedy will provide effective source control and reduce the potential for contaminant migration. A vegetated soil cover is included in this remedy to reduce potential exposure to contaminated soil. Additionally, it is expected that the remedy will lower infiltration somewhat, thereby reducing the contamination migration to groundwater. To monitor contaminant migration over time, groundwater monitoring will be conducted. Landfill gas will be collected in a passive gas collection system and vented to

the surface. Land use restrictions will be implemented to prevent future disturbance of the landfill contents beneath the soil cover.

2.5 Site Characteristics

This section provides a summary of site features; sources, nature, and extent of contamination; and contaminant fate and transport. Additional detail is provided in the RI report (CH2M HILL, 1998).

2.5.1 Site Conceptual Model

The primary site features at Sites 1 and 12 consist of fill areas (Areas B and D, the Fishing Point and Rifle Range landfills), a concrete and reinforcing steel disposal area (Area A), a wooded ravine littered with surface debris (Area C), a marsh (Area E), and a hillside (Area F) east of the Fishing Point Landfill. The site is bounded to the north and west by the Patuxent River, and groundwater is generally present within 5 feet below ground surface (bgs). Major features of Sites 1 and 12 are described below.

2.5.1.1 Landfills

The lateral extent of the Fishing Point and Rifle Range landfills was delineated based on the results of a geophysical investigation conducted in 1998. Landfill boundaries are displayed in Figure 2-3. Test pits completed in each landfill indicated a shallow (less than 12-inch) layer of soil covering the waste material in many areas. Contents found in the landfills included scattered construction debris, unburned domestic refuse, burned debris, and charred metal and glass objects. Empty metal debris, including cabinets, desks, playground equipment, paint cans, and rusting 55-gallon drums, were also observed. Fill material is not continuous across the site, indicating that some areas were not used for trash disposal. Trash thickness observed during the RI was between 5 and 12 feet.

2.5.1.2 Surface Water Features

The primary surface water feature in the vicinity of Fishing Point is the Patuxent River, which borders the site to the west and north. Approximately 2.6 acres of emergent wetlands, dominated by the common reed (*Pliragmites australis*), are present on top of Site 1. Although most of the surface drainage from Site 1 flows towards the northwest into the Patuxent River, surface water ponds develop on Site I due to the impermeability of the soils and poor drainage away from the landfill. Site 12, located immediately south of Site 1, grade's toward the west into a 3.5-acre wetland designated as Area E. During a wetlands delineation conducted by CH2M HILL in January 1998, no outlets from the wetland were found, and no direct connectivity between the wetland and the Patuxent River was observed.

2.5.1.3 Groundwater Features

Shallow groundwater is present in an unconfined aquifer with a water level ranging from 3 to 4 feet below ground surface.

The uppermost 100 feet of soil underlying Sites 1 and 12 consist of unconsolidated gravel, sand, silt, and clay. These units, in order of increasing depth, are:

- The Lowland Deposits, consisting of orange or gray sand, silty sand, and gravely sand with a total thickness of 45 to 65 feet;

- The St. Mary's Formation, a dark greenish-gray sand, silty sand, and sandy silt with abundant oyster shell hash (not present at all locations). The St. Mary's Formation can be up to 80 feet thick, although none of the monitoring well borings penetrated the entire thickness of this formation at Sites 1 and 12;

- An olive-gray silt and clay unit of the St. Mary's Formation.

A discontinuous silty sand layer occurs in the upper 6 feet within the Lowland Deposits. This surficial silty sand unit is absent on some steep grades. Another discontinuous 10- to 15-foot-thick silty sand layer occurs at mid-depth within the Lowland deposits. This layer thins out near Cedar Point Road on the southeast and beneath the low, flat area on the northwest portion of Fishing Point Landfill. The St. Mary's olive-gray silt and clay unit is approximately 20 feet higher in upland areas than in the low, flat area near the river.

The upper St. Mary's Formation is sufficiently permeable to transmit groundwater flow, and it is in direct hydraulic connection with the surficial deposits at the site. For this reason, the upper St. Mary's Formation and the Lowland deposits function together as the surficial aquifer at Sites 1 and 12.

Despite the presence of silt and clay in the units described above, there do not appear to be any continuous low-permeability confining units in the upper 60 to 90 feet of sediment at Sites 1 and 12. Hence, groundwater is unconfined down to the bottom of the monitoring well network.

The average linear horizontal groundwater velocity in the Lowland Deposits at Fishing Point is estimated at 80 to 130 feet per year. The average linear velocity within the upper portion of the St. Mary's Formation at Fishing Point is approximately 20 to 30 feet per year, due to the lower hydraulic conductivity in this unit. The general groundwater flow direction at Sites 1 and 12 appears to be west and north toward the Patuxent River. There appears to be little horizontal flow in the shallow aquifer east towards Harper's Creek from the landfills at Sites 1 and 12.

Near-shore upward flow potentials are consistent with the typical pattern of groundwater flow discharging into a major waterway like the Patuxent River. Groundwater discharge from both the Lowland deposits and the St. Mary's Formation would be expected to flow into the Patuxent River.

Based on an analytical groundwater flow model for Sites 1 and 12, a groundwater production well installed in the shallow aquifer would result in intrusion of brackish river water into the shallow aquifer to a distance of 100 to 150 feet from shore. Such brackish-water intrusion would result in a Class III designation for shallow groundwater downgradient of the landfill, indicating that the water is not suitable for potable use.

2.5.1.4 Site Ecology

Both plant and animal life inhabit Sites 1 and 12 and their surrounding areas. The sites were previously used for landfilling and are covered by sparse, herbaceous plant species. Aquatic systems (habitat for fish and invertebrate species) include an intermittent stream

that runs along the south side of Site 1 before emptying into the Patuxent River and the shoreline and beaches along the Patuxent River. The northern shoreline is relatively shallow with depths of 2 to 4 feet within 100 feet of the beach. The western shoreline drops off rapidly and attains depths of as much as 30 feet within 100 feet of the beach. The Patuxent River is brackish in the vicinity of the NAS. Approximately 3.5 acres of palustrine emergent, scrub /shrub, and forested wetlands are located between the beach and Site 12. Upland slopes adjacent to Site 12 contain arboreal vegetation.

A total of 2.6 acres of emergent wetlands are located in isolated areas on Site 1. They are dominated by common reed *(Phragmites australis*) with soft rush, bulrush, and Canada rush also present. The soil is mainly compacted sand and fill with poor permeability.

Birds, reptiles, amphibians, and mammals use the site and its surrounding habitats. The RI report (CH2M HILL, 1998) documents the specific herbaceous plant species, aquatic species, birds, reptiles, and amphibians that have been identified on Sites 1 and 12.

2.5.2 Sources of Contamination

The boundaries of Sites 1 and 12 landfills, delineated by a geophysical investigation, are displayed in Figure 2-3. The test pit investigation, undertaken as part of the RI, characterized the landfill contents as construction debris, unburned domestic refuse, burned debris, and charred metal and glass objects, as well as specific widely-scattered items such as a syringe, a medicine bottle, cabinets, desks, playground equipment, paint cans, and empty 5-gallon drums.

Sites 1 and 12 are municipal landfills in which co-disposal of hazardous and municipal waste occurred, but the location of highly toxic and/or mobile material is not known. Although the waste materials in Sites 1 and 12 were not sampled for chemical analysis, the source areas of contamination are assumed to be distributed throughout these landfills.

In 1990, a permitted application of wastewater treatment plant sludge from St. Mary's County was deposited on the former soil borrow area east of Site 1 (Area F). The sludge was applied to provide organic material so that the area could be revegetated. Such sludge generally contains elevated concentrations of inorganic compounds, including heavy metals. The sludge material is believed to be the source of elevated inorganic chemical concentrations measured in areas outside the landfill footprints.

2.5.3 Nature and Extent of Contamination

Based on the previous site investigation and RI findings, waste materials disposed at Sites 1 and 12 have impacted groundwater, marsh surface water, and marsh sediment. The investigations at Sites 1 and 12 were developed using EPA's guidance on presumptive remedies for municipal landfills. According to this guidance, containment alternatives, for example, covering the site to prevent contact, are accepted remedies for landfills. Therefore, it was determined that it was not necessary to sample landfill wastes. The investigations to characterize the landfills focused on media impacted by the migration of contamination. The results of the investigations are summarized in the following subsections.

2.5.3.1 Soil Gas

Soil-gas measurements were collected below ground during the RI to determine whether significant concentrations of methane and total volatile organic compounds (VOCs) were being produced by landfilled debris. Methane was detected at 4 locations, both at Site 1 and at Site 12, at between 1 percent and 34 percent by volume. The highest concentrations of methane were detected at Site 12 (25 to 34 percent by volume). Significant concentrations (up to 16 percent) also were detected in the northeastern portion of Site 1. No VOCs were detected in soil gas at either Site 1 or Site 12.

2.5.3.2 Groundwater

Concentrations of several analytes detected in groundwater exceeded federal Maximum Contaminant Levels (MCLs) for drinking water. Out of 19 groundwater monitoring wells sampled during the RI, four metals and one volatile organic compound were found to exceed MCLs. The locations of monitoring wells at Sites 1 and 12 are identified in Figure 2-3.

Antimony, cadmium, nickel, and thallium were each detected in at least one monitoring well at levels exceeding their respective MCLs. However, antimony and thallium were present at similar levels in the background monitoring well, 1MW-5B. Antimony was detected at 6.1 micrograms per liter (µg/L) to 8 µg/L in wells along the shore (lMW-lB, 1MW-3A, 1MW-3B, 1MW-4B, 1MW-12, and 12MW-1), and at 8.5 µg/L in the background well 1MW-5B. Thallium was detected at estimated concentrations of 2.4 to 2.9 µg/L in wells along the shoreline (lMW-3A, 1MW-7A, 1MW-8, 1MW-12) and at 2.2 to 3.7 µg/L, respectively, in the background wells 1MW-5B and 1MW-5A. Cadmium and nickel were present above background levels but exceeded MCLs only in one well, 1MW-7B, located near the downgradient edge of the landfill. Total (unfiltered) cadmium was detected in this well at 11 µg/L, compared to an MCL of 5 µg L. Total nickel was detected at 118 µg/L, compared to an MCL of 100 µg/L.

Chlorobenzene was detected in well 1MW-6, along the downgradient edge of the landfill, at a concentration of 130 µg/L, as compared to an MCL of 100 µg/L.

2.5.3.3 Surface Water

During the RI and again in Spring 1998, surface wafer samples were collected from the Patuxent River and Area E, the marsh located west of Site 12. Surface water sampling locations are identified in Figure 2-4. Because surface water in the marsh is not part of OU-1, marsh water quality is not discussed in this ROD.

No organic chemicals were detected in river surface water samples. Inorganic chemicals detected at the highest concentrations were those associated with brackish or salt water (calcium, magnesium, potassium, and sodium). Several additional inorganic chemicals, such as aluminum (5 of 5 samples), arsenic (4 of 5 samples), iron (5 of 5 samples), and zinc (5 of 5 samples), were also detected in some of the river surface water samples at levels that do not pose a significant risk to human health. Inorganic chemical concentrations detected in surface water were similar to background levels in the Patuxent River.

2.5.3.4 Sediment

During the RI and again in the Spring of 1998, sediment samples were collected from the Patuxent River and the Area E marsh. Sediment sample locations are shown in Figure 2-4.

Sediment collected from the river contained little evidence of contamination. Organic compounds were detected in some samples at low concentrations. Dichloro diphenyl trichloroethane (DDT) and its degradation products (dichloro diphenyl dichloroethane [DDD] and dichloro diphenyl dichloroethylene [DDE]) were detected in one sample along the western side of the landfill at approximately 10 micrograms per kilogram (µg/kg) each, while DDT alone was detected at a second location along the western side of the landfill at approximately 2 µg/kg. Two polynuclear aromatic hydrocarbons (PAHs), fluoranthene and pyrene, were detected in one sample along the north side of the landfill. Analytical results indicate the possible presence of 4-methylphenol in six of the 21 sediment samples scattered along the west and north sides of the landfill, at concentrations below the contract-required detection limit (CRDL) ranging from approximately 51 µg/kg to approximately 250 µg/kg. There was no pattern to inorganic concentrations in river sediment.

Additional information about marsh sediment will be collected during an upcoming ecological study of the area. Since sediment in Area E is not included in OU-1, sediment samples from this Area are not discussed in this ROD but will be addressed as part of OU-2.

2.5.3.5 Soil

During the RI, surface soil samples were collected around the Fishing Point and Rifle Range landfills, primarily in Area F. Samples of waste material in the landfills were not analyzed for chemical constituents, since contamination in the landfills was assumed to exist throughout the landfill footprints. This approach is consistent with the use of a presumptive remedy for municipal landfills, since the entire landfill site will be covered to prevent contact with materials that are presumed contaminated.

In April 1998, additional soil samples were collected to further characterize the extent of inorganic contamination that posed a potential for ecological risk at the site. Five surface soil samples and three deep samples (collected between 2.5 to 3 feet bgs) were collected and analyzed for target analyte list (TAL) metals and cyanide. Locations of soil samples collected during the RI and in April 1998 are displayed in Figure 2-5.

Elevated concentrations of inorganics in Area F are the result of a wastewater treatment plant sludge application, permitted by MDE, that occurred in 1991.

Outside Area F, several PAHs were detected in two samples (1SS-11 and 1SS-12), collected in Area A, at concentrations that slightly exceeded conservative ecological risk screening criteria, described later in this ROD. In addition to PAHs, DDE and DDT were detected in one soil sample (12SS-2), collected immediately east of Site 12, at concentrations exceeding ecological screening criteria.

2.5.4 Contaminant Fate and Transport

The source areas of contamination at Sites 1 and 12 are distributed throughout the landfills. The source of contamination detected in Area F is wastewater treatment plant sludge that was applied in 1991.

Contaminants identified in soil and sediment generally have very low mobility. Inorganics tend to adsorb to inorganic clay particles or other particulate matter, and have very low solubility. PAHs also have very low solubility, and tend to strongly adsorb to organic material in soil. Pesticides such as DDE and DDT have similarly low mobility.

The contaminants listed above may be transported via surface water runoff or groundwater flow to sediment in the marsh or in the river. However, the contaminants would not likely be released into the surface water due to their strong tendency to bind to the organic and inorganic matter in soil and sediment. A hurricane or other tidal inundation with high waves could mobilize and resuspend potentially contaminated material in low-lying areas.

2.6 Current and Potential Future Land and Resource Uses

2.6.1 Land Uses

There is currently no access to, or use of, Sites 1 and 12. Following the completion of the remedial action, limited recreational use is planned for the sites. Any future recreational land use will be protective of human health and the environment. Land use restrictions will be implemented to prevent damage to the soil cover that will be placed over the waste in the Fishing Point and Rifle Range Landfills.

2.6.2 Ground and Surface Water Uses

Groundwater under Sites 1 and 12 is not used as a drinking water source. Groundwater contained in the surficial aquifer beneath the site would experience brackish water intrusion if pumped routinely, making water withdrawn from the aquifer non-potable. Because St. Mary's County prohibits installation of drinking water wells within the surficial aquifer, it is anticipated that groundwater beneath Sites 1 and 12 will not be used as a drinking water source after the implementation of remedial actions.

The Patuxent River is the primary surface water resource in the vicinity of Fishing Point. The river is currently used for recreational purposes, primarily fishing. There is currently no access to the Patuxent River from the Fishing Point area. Each of the remedial alternatives described for the ROD allow for renewed access to the Patuxent River from Fishing Point. For this reason, it is anticipated that Fishing Point will again be used for recreational access to the Patuxent River after remedial actions have been implemented at Sites 1 and 12.

2.7 Summary of Site Risks

The response action selected in this ROD is necessary to protect public health, welfare, or the environment from actual or threatened releases of hazardous substances into the environment.

Potential human health and ecological risks associated with exposure to contaminated media at Sites 1 and 12 were evaluated as part of the RI and FS. A summary of the human health and ecological risks associated with Sites 1 and 12 are summarized below. The risk assessment results for the marsh (Area E) are not addressed in this ROD, since the marsh is not included in OU-1. The marsh will be addressed as a separate operable unit (OU-2), following the completion of an ecological study of the area.

The EPA guidance *Conducting Remedial Investigationsl Feasibility Studies for CERCLA Municipal Landfill Sites* (EPA/540/P-91/001) streamlines the FS process for specific classes of sites with similar characteristics, such as types of contaminants present, types of disposal practices, or how environmental media are affected. Landfill sites share similar characteristics; therefore, presumptive remedies are used to ensure consistency in remedy selection and to reduce the cost and time required to clean up similar types of sites. Sites 1 and 12 are landfills in which co-disposal of hazardous and municipal waste occurred, but the location of highly toxic and/or mobile material is not known. The presumptive remedy for such landfills is containment. Because of this classification, landfill contents were not sampled, and potential risks to human and environmental receptors from landfill materials were assumed to be present but were not quantitatively evaluated.

Additional hazards are posed to human and ecological receptors by the proximity of landfill debris to the surface. In most cases, only a thin layer of soil cover separates the landfill from humans and ecological receptors. Several areas contain exposed surface debris that could pose a physical hazard to recreational users and trespassers.

2.7.1 Summary of Human Health Risk Assessment

A baseline human health risk assessment was conducted to characterize the current and future human health risks at Sites 1 and 12 if no additional remediation were implemented. The risk assessment was prepared utilizing conservative assumptions, and all feasible exposure pathways were considered based on current site conditions and current and potential future site usage.

The human health risk assessment for Sites 1 and 12 was comprised of the following components:

- **Identification of Chemicals of Potential Concern (COPCs) -** identified and characterized the distribution of COPCs found onsite. Chemicals identified in this screening were the focus of the subsequent evaluation in the risk assessment. COPCs were identified by comparing the maximum concentrations of chemicals in each medium (soil, surface water, sediment, and groundwater) to EPA Region III health-based criteria that were developed using current toxicity factors and exposure formulas. Human nutrient (calcium, magnesium, potassium, and sodium) concentrations also were compared to Recommended Daily Allowances (RDAs). Constituents detected in surface soil were statistically compared to background surface soil data from the NAS.

- **Exposure Assessment -** identified potential pathways by which exposure could occur, characterized the potentially exposed populations (e.g., workers, residents, trespassers) and estimated the magnitude, frequency, and duration of exposures. The exposure pathways listed below were selected in consultation with EPA Region III. All of these pathways were quantified for potential exposure.

The exposure scenarios under current land use included:

- Site worker: incidental ingestion of and dermal contact with surface soil, groundwater, surface water, and sediment; and inhalation of fugitive dust from surface soil.

- Trespassers playing on or walking across the site: inhalation of fugitive dust; incidental ingestion of and dermal contact with surface soil.

- Recreational users (adult and child): incidental ingestion of and dermal contact with surface water and sediment from the Patuxent River.

The future land use exposure routes included:

- Residents living on the site: inhalation of fugitive dust, incidental ingestion of and dermal contact with surface soil; inhalation of volatiles from groundwater while showering (adults), ingestion, and dermal contact with groundwater.

- Recreational users (adult and child): incidental ingestion of and dermal contact with soil, surface water, and sediment; inhalation of fugitive dust from surface soil.

- Site worker: incidental ingestion of and dermal contact with soil, groundwater, surface water, and sediment; and inhalation of fugitive dust from surface soil.

- Construction worker: inhalation of fugitive dust from, incidental ingestion of, and dermal contact with surface soil.

Direct contact with landfill wastes was not quantitatively evaluated because the presumptive remedy for landfills assumes that there is a risk due to exposure to landfill materials, and therefore landfill contents were not sampled.

- **Toxicity Assessment -** identified the types of adverse health effects associated with exposure to COPCs along with available toxicity factors (e.g., cancer slope factors and reference dose values), and summarized the relationship between magnitude of exposure and occurrence of adverse health effects. It also identified related uncertainties (such as the weight-of-evidence of a particular chemical carcinogenicity in humans) associated with these values.

- **Risk Characterization -** integrated the results of the exposure assessment and toxicity assessment to estimate the potential risks to human health. Both cancer and non-cancer human health effects were evaluated. Pathways that posed an unacceptable risk based on quantitative risk characterization were identified.

- **Uncertainty Assessment -** identified sources of uncertainty associated with the data, methodology, and the values used in the risk assessment estimation.

All of the above components were evaluated following CERCLA regulations, using EPA risk assessment guidance (Risk *Assessment Guidance for Superfund,* EPA, December 1989; see table of references at the end of this document).

For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$Risk = CDI \times SF$$

where: risk the probability (e.g., 2×10^{-5})of an individual's developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(mg/kg\text{-}day)^{-1}$

These risks are probabilities that usually are expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer which individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual's developing cancer from all other causes has been estimated to be as high as one in three. EPA's acceptable risk range for site-related exposures is 10^{-4} to 10^{-6}.

All of the current and future carcinogenic risks for the individual pathways (ingestion, inhalation, and dermal contact) quantitatively evaluated in this assessment were below or within the EPA's acceptable risk range. The presumptive remedy for municipal landfills assumes that there is an unacceptable risk from direct contact with landfill wastes; this pathway was not quantitatively evaluated in this assessment.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., life-time) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ less than 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. The hazard index (HI) is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI less than 1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows:

$$\text{Non-cancer HQ} = CDI/RfD$$

where: CDI = Chronic daily intake
RfD = reference dose

The intake and RfD are expressed in the same units and represent the same exposure period (i.e., chronic or subchronic).

All of the current-use exposure scenarios were below the EPA's non-cancer recommended level. The only individual pathways for the future use scenario that exceeded the EPA non-cancer recommended level are:

- Ingestion of groundwater (St. Mary's formation) by the hypothetical future residential child and adult

- Ingestion of groundwater (St. Mary's formation) by the hypothetical future site worker

No hazard index was calculated for direct contact with landfill wastes because the presumptive remedy assumes that there is an unacceptable risk if humans were to be exposed to these materials. Of the media that were quantitatively evaluated, groundwater is the only media that resulted in non-cancer hazards above the EPA recommended levels. The constituents that are the non-cancer drivers for groundwater are antimony, cadmium, and manganese. Tables presenting the estimated noncarcinogenic risk for groundwater ingestion are presented in Appendix C.

The analytical results of the historic data from the monitoring wells from 1991 (three rounds) revealed inorganic constituents at lower concentrations during this RI than during the 1991 sampling. This was most evident with dissolved aluminum and dissolved iron. This trend also was evident to a lesser extent for calcium, magnesium, potassium, and sodium. In contrast to the general trend, inorganics in one well north of Site 1 were consistently higher in 1996 than in 1991. The inorganic concentrations in this well were the primary drivers for the high hazard index calculated for groundwater exposures.

Antimony concentrations detected in the groundwater sample upgradient of the landfill sites exceeded the site-related concentrations. Therefore, it does not appear that antimony is a landfill-related. constituent.

The primary quantified chemical exposure risk to human health from the landfill sites is from potential future residential and site worker contact with contaminated groundwater from the St. Mary's Formation. However, the exposure assumption that site groundwater might be used as a potable water source is highly conservative due to the hydraulic connection between the St. Mary's Formation and the surficial Lowland Deposits. The two formations together form the surficial aquifer and would experience brackish water intrusion downgradient of the landfills if pumped routinely, making water withdrawn from these deposits non-potable. Even though there were exceedances of the MCLs in groundwater downgradient from the landfill, the water downgradient from the landfill is Class III groundwater, therefore there is no potential risk. In addition, St. Mary's County prohibits installation of drinking water wells within the surficial aquifer (Class III aquifer) throughout the NAS.

Because there is no reasonable human exposure scenario for contaminated groundwater, the risks associated with groundwater at Sites 1 and 12 are considered to be negligible and are not addressed further in this ROD.

2.7.2 Summary of Ecological Risk Assessment

A screening-level ecological risk assessment (ERA) was conducted to characterize ecological risks at Sites 1 and 12 if no additional remediation is implemented.

In conducting the screening-level ERA for Sites 1 and 12, Contaminants of Potential Concern (COPCs) were identified using benchmark screening levels developed by the EPA Region III Biological Technical Assistance Group (BTAG). The potential exposure of selected environmental receptors to each COPC was then calculated. Receptor species were chosen for assessment for one or more of the following reasons:

1. They are known to occur on the site;

2. Suitable habitat exists for their occurrence;

3. They serve as surrogate species with the potential to occur, and have been included because of the availability of life history information;

4. They provide representation for a variety of positions in the food chain; and

5. They complete an exposure pathway.

The life history information for each of the receptor species was researched. This information was used, along with the mean and maximum constituent concentrations for each media, to determine potential exposure dosages. These dosages were compared to chronic toxicity data for each of the species.

The screening-level ERA determined that there was a potential for adverse ecological effects resulting from the river surface water and sediment. However, the potential risk from metals and pesticides in surface water and sediment was not evaluated further because the metals and pesticides appear to be within the background range.

Slightly elevated metal concentrations were detected in soil east of Site 1 (Area F) during sampling. Review of the historical record for the landfills reveals that this area was used as a source of soil to cover the landfills. After the soil was removed, the area received an application of solid waste sludge from the St. Mary's County Metropolitan Commission (the municipal waste water treatment facility) to amend the soil with organic material so that vegetation could be re-established. The sludge application was permitted by the State of Maryland. Although some metals in soil from Area F slightly exceed the conservative screening levels used in ecological risk assessments, the soil was not evaluated further because it will be used as the base for the final vegetated soil cover on the landfills. By using the soil from this area as the base for the final vegetated cover, the pathway of exposure for ecological receptors is minimized. Therefore, no further action or study is required at Area F.

In addition, an ecological evaluation showed that no compounds were present above background levels for the concrete rubble disposal area northeast of Site 1 (Area A). A separate evaluation is currently under way to determine whether any release occurred from the surface debris within the 0.25 acres of the ravine at Area C, and if so, whether any soil in addition to the debris needs to be removed. The conclusions of this evaluation will be documented in the public record at a future date.

2.7.3 Basis for Action

Based on the human health and ERAs, the response action selected in this ROD is necessary to protect the public health or welfare and the environment from exposure to the landfill debris, since in most cases, only a thin layer of soil cover separates the landfill from trespassers. Several areas contain exposed surface debris that could pose a physical hazard to recreational users, trespassers, and environmental receptors.

2.8 Remedial Action Objectives

During the FS, a detailed analysis of possible remedial alternatives was conducted for Sites 1 and 12. Each remedial alternative was developed to meet remedial action objectives (RAOs), which were based on an evaluation of site conditions, potential risks, and legal requirements for Sites 1 and 12. The following RAOs were identified:

- Protect human health and the environment;
- Comply with all applicable or relevant and appropriate federal and state environmental laws and regulations;
- Be cost effective;
- Use permanent solutions and alternative treatment technologies or resource-recovery technologies to the maximum extent practicable;
- Prevent or minimize direct contact of human and ecological receptors with landfill contents and surface soil within the landfill boundaries, and with surface debris in the adjacent areas;
- Prevent surface water run-on, control surface water runoff, and minimize erosion within the Site 1 and Site 12 landfill boundaries;
- Enhance ecological habitat through revegetation;
- Reduce further migration of contamination from the landfill to the groundwater and surface water.

In addition, each remedial alternative should maintain existing ecological habitat and develop recreational use to the extent possible, recognizing that the primary objective of this remedial action is to prevent human and ecological exposure to waste materials in the landfill.

2.9 Description of Alternatives

To meet RAOs listed above, remedial technologies were screened to develop remediation alternatives. Technologies were screened based on their suitability for specific site characteristics, including contaminant types, quantities, and concentrations; and physical site conditions. The following remedial technologies were included in the initial screening process: institutional controls with long-term monitoring, containment, in-situ and ex-situ

treatment, removal, and disposal. A detailed description of the remedial technologies screening process is provided in the FS.

Using the remedial technologies retained following initial screening, five remedial action alternatives were developed to meet the RAOs. Remedial alternatives were developed to address Sites 1 and 12, including the landfills (Areas B and D); surface debris adjacent to the landfills (Area C) surface water and sediment contamination in the adjacent marsh area (Area E); and surface soil east of the landfills (Area F), which was amended in 1990 with the application of wastewater treatment plant sludge. Concrete rubble and reinforcing steel identified in Area A are classified as 'clean fill' under Maryland State Regulations. As a result, no action is proposed in Area A.

The following remedial alternatives were originally listed in the FS for OU-1 at Sites 1 and 12:

- Alternative 1 - No Action

- Alternative 2 - Institutional Controls and Long-term Monitoring; Installation of a Soil Cover Over Areas B and D; Excavation of Contaminated Material and Debris From Areas C and E, and Offsite Disposal

- Alternative 3 - Institutional Controls and Long-term Monitoring; Installation of a Soil Cover Over Areas B, D and E; Excavation of Contaminated Material and Debris From Area C, and Offsite Disposal

- Alternative 4 - Institutional Controls and Long-term Monitoring; Installation of a Resource Conservation and Recovery Act (RCRA) Subtitle D Cap Over Areas B and D; Excavation of Contaminated Material and Debris From Areas C and E, and Disposal in Areas B and D

- Alternative 5 -- Institutional Controls and Long Term Monitoring; Installation of a RCRA Subtitle D Cap Over Areas B, D and E; Excavation of Contaminated Material and Debris From Area C, and Disposal in Areas B and D

Following the completion of the FS, a decision was made among the Navy, EPA, and MDE to designate the marsh (Area E) as a separate OU (OU-2) from the remaining five areas at Sites 1 and 12. The decision was made because: 1) the marsh contains a different contaminated medium (sediment) than Areas A, B, C, D, and F; and 2) the marsh requires further study to quantify ecological risks and determine whether there is a need for remedial action. Because of the designation of the marsh as OU-2, remediation of the marsh is not considered in this ROD, but will be considered at a later date following the completion of an ecological study in the area.

In the FS, Alternatives 3 and 5 called for the placement of soil cover and a RCRA Subtitle D cap, respectively, over the marsh. However, since the marsh is no longer included in OU-1, Alternatives 3 and 5 are no longer being considered. For purposes of discussion in this ROD, Alternative 4, listed above, has been renamed "Alternative 3".

2.9.1 Description of Remedy Components

Major components of each remedial alternative are provided in the following subsections.

2.9.1.1 Alternative 1 - No Action

Description: Under this alternative, no further effort or resources would be expended at Sites 1 and 12. Alternative 1 serves as the baseline against which the effectiveness of the other alternatives is judged.

Costs: There would be no costs associated with this alternative.

2.9.1.2 Alternative 2 - Soil Cover

Description: Alternative 2 includes the installation of a soil cover over the Fishing Point Landfill (Site 1) and the Rifle Range Landfill (Site 12), and excavation and offsite disposal of surface debris from Area C. The major components of Alternative 2 include the following:

- Installation of a soil cover over the Fishing Point Landfill (Site 1) and Rifle Range Landfill (Site 12). The soil cover will consist of a minimum of 6 inches of topsoil overlain by a minimum of 18 inches of clean vegetative support material.

- Excavation and offsite disposal of construction debris from a ravine adjacent to Rifle Range Landfill.

- Shoreline stabilization on the northwest portion of the landfills to prevent erosion of the Fishing Point Landfill, protect the soil cover, and maintain access to the western beach for limited recreational use. Stabilization and erosion control measures will preserve habitat along the shoreline to the extent possible, and will maintain access to the western beach for recreational use.

- One-for-one mitigation of approximately 3.6 acres of emergent wetlands, eliminated or disturbed as the result of installing the soil cover over Sites 1 and 12, either onsite or elsewhere on the NAS.

- Land use restrictions to prevent future disturbance of the landfill contents at Sites 1 and 12 beneath the soil cover.

- Five-year reviews at Sites 1 and 12. Long-term monitoring will be conducted to track future contaminant migration and monitor the effectiveness of the remedy, and data will be evaluated during the 5-year site reviews.

- An operation and maintenance (O&M) plan for Sites 1 and 12 will consist of monitoring and maintenance of the stormwater management system, vegetation cover, and erosion control structures. Groundwater monitoring will be conducted using the existing onsite monitoring wells or replacement monitoring wells.

In addition to the components of Alternative 2 specified in the FS, soil from Area F would be used as a base to establish grades necessary for the soil cover at the Sites 1 and 12 landfills, and landfill gas would be collected through a passive gas collection system and vented to the atmosphere.

Costs: The estimated costs for Alternative 2 are as follows:

- Capital $ 3,720,000
- Annual operation and maintenance: $ 56,564
- Net present worth (30 year, 5% discount rate): $ 4,590,000

The capital cost of the landfill gas collection system, which was not calculated for the FS, is estimated at $66,500 (in addition to the above costs).

Estimated Implementation Time: The estimated implementation time for Alternative 2 is 12-18 months (not including O&M or wetland mitigation). The estimated time to construct functioning wetlands to mitigate those disturbed as part of capping activities is 15 to 18 months after the wetland design is completed.

2.9.1.3 Alternative 3 - RCRA Subtitle D Cap

Description: Alternative 3 includes the installation of a RCRA Subtitle D cap over Areas B (Site 1) and D (Site 12), and excavation of surface debris from Area C (debris would be disposed of into the landfills at Sites 1 and 12). The major components of Alternative 3 include the following:

- Excavation of the surface debris from Area C. The excavated material will be disposed of in the Sites 1 and 12 landfills. Additional soil required to establish grades prior to capping of Sites 1 and 12 will be obtained from Area F.

- Installation of a RCRA Subtitle D cap over Sites 1 and 12. The RCRA Subtitle D cap will consist of 6 inches of topsoil; 18 inches of vegetative support; a 12-inch gravel drainage layer; a geosynthetic membrane; and 6 inches of bedding soil. The cap will be designed with minimum 5 percent grade and maximum 3:1 grades to promote drainage and ensure stability in accordance with RCRA design guidelines. A vegetative cover will be established over the capped area. A passive landfill gas system win be installed to vent landfill gases.

- Shoreline stabilization on the northwestern portion of the landfills to prevent erosion of the Fishing Point Landfill, protect the soil cover, and maintain access to the western beach for recreational use. Stabilization measures will preserve habitat along the shoreline to the extent possible, and will maintain access to the western beach for recreational use.

- Emergent wetlands eliminated as a result of the installation of the cap on the Site 1 landfill (approximately 2.6 acres), along with the portion of the marsh impacted by installation of the cap (approximately 1 acre), will be mitigated (one-for-one) elsewhere on the NAS.

- Land use restrictions will be incorporated into the Navy's planning documents to prevent future disturbance of the landfill contents at Sites 1 and 12 beneath the RCRA cap (i.e., restrictions on hunting, drilling, and digging). Provisions will be made to allow pedestrian access to the site for recreational purposes, but warning signs and other methods will be used to prohibit vehicle access and other activities that may potentially damage the cap.

- Five-year site reviews will be required at Sites 1 and 12, since contamination would remain in place at these areas under this alternative. Long-term monitoring will be conducted to track future contaminant migration and to monitor the effectiveness of the remedy, and data will be evaluated during the 5-year site reviews.

- An O&M plan will be implemented at Sites 1 and 12. O&M will consist primarily of maintaining the gas extraction system, stormwater management system, and vegetation, and preventing erosion. Groundwater monitoring will be conducted using the existing monitoring wells onsite. Perimeter monitoring of landfill gas will be implemented to monitor potential horizontal migration. Further evaluation of the landfill gas data will be done during the design to verify the necessity of perimeter monitoring.

In addition to the components of Alternative 3 specified in the FS, soil from Area F would be used as a base to establish grades necessary for the soil cover at the Sites 1 and 12 landfills.

Costs: The estimated costs for Alternative 3 are as follows:

- Capital $ 7,420,000
- Annual operation and maintenance: $ 66,564
- Net present worth (30 year, 5% discount rate): $ 8,440,000

Estimated Implementation Time: The estimated implementation time for Alternative 3 is 24 months (not including O&M or wetland mitigation). The estimated time to construct functioning wetlands to mitigate those disturbed as part of capping activities is 15 to 18 months following completion of the design.

2.9.2 Common Elements and Distinguishing Features of Each Alternative

Alternatives 2 and 3 share a common remediation approach for Sites 1 and 12. Key applicable or relevant and appropriate requirements (ARARs) are the same for each alternative, and these ARARs are summarized in Appendix D. The quantity of untreated waste that would remain onsite is identical under Alternatives 2 and 3, except for waste in Area C that would be transported off site under Alternative 2. The following elements are common to both alternatives:

1. Containment of wastes in Sites 1 and 12;

2. Excavation and disposal of contaminated material from the ravine at Area C;

3. Implementation of stabilization measures along a portion of the western shoreline of Fishing Point;

4. Mitigation of wetlands that are eliminated during the construction of the soil cap or cover material;

5. Implementation of institutional controls to prevent disturbance of the cap or soil cover; and

6. Completion of 5-year site reviews and long-term monitoring.

The primary feature that distinguishes Alternative 2 from Alternative 3 is the material that is placed over waste in Sites 1 and 12. Alternative 2 calls for a soil cover, consisting of a minimum of 24 inches of subsoil and topsoil. Alternative 3 provides for a RCRA Subtitle D cap, which consists of topsoil, subsoil for vegetative support, drainage layer, geosynthetic

membrane, and bedding soil. The costs and project duration associated with Alternatives 2 and 3 reflect the differences in cover design implemented under each alternative.

2.9.3 Expected Outcomes of Each Alternative

Under both Alternatives 2 and 3, provisions will be made to allow pedestrian access to Sites 1 and 12 for recreational use. The amount of time that access to the western shoreline would be blocked due to construction would be approximately 12 to 18 months (approximately 6 months longer for Alternative 3), between installation of the cover and revegetation of the area. Land use restrictions will be implemented to prevent disturbance of the soil cover or RCRA Subtitle D cap overlying waste in Sites 1 and 12.

Groundwater within the surficial aquifer beneath Sites1 and 12 will not be used for drinking water purposes. St. Mary's County already prohibits the installation of drinking water wells within the aquifer.

2.10 Summary of Comparative Analysis of Alternatives

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) outlines the approach for comparing remedial alternatives. Evaluation of the alternatives uses "threshold" criteria, "primary balancing" criteria, and "modifying" criteria. All alternatives are evaluated against the threshold and primary balancing criteria, which are technical criteria based on human health and environmental protection, cost, and engineering feasibility.

To be considered for remedy selection, an alternative must meet the two threshold criteria:

1. Overall protection of human health and the environment
2. Compliance with ARARs

The primary balancing criteria then are considered to determine which alternative provides the best combination of attributes. The primary balancing criteria are:

1. Long-Term Effectiveness and Permanence
2. Reduction in Toxicity, Mobility, or Volume through Treatment
3. Implementability
4. Short-Term Effectiveness
5. Cost

The preferred alternative is evaluated further against two modifying criteria:

1. State acceptance
2. Community acceptance

Each of the alternatives presented in Section 2.9 were compared using the threshold, primary balancing, and modifying criteria. The summary analysis and evaluation of each remedial alternative is provided below. The FS provides a more detailed analysis and evaluation

2.10.1 Threshold Criteria

2.10.1.1 Overall Protection of Human Health and the Environment

The soil cover and cap designs required by Alternatives 2 and 3, respectively, would prevent direct contact of human and ecological receptors with landfill contents. Both of these alternatives would be constructed to minimize surface water run-on, control surface water runoff, and reduce erosion from the Site 1 and 12 landfills. Alternative 3 would be the most protective because the RCRA Subtitle D cap would reduce surface water infiltration through the landfill to the greatest extent of the alternatives under consideration. Alternative 1 would not protect human health and the environment and is, therefore, no longer considered in this analysis.

2.10.1.2 Compliance with ARARs

Alternative 3 complies with ARARs. Under Alternative 2, the construction of a 2-foot soil cover (instead of a RCRA Subtitle D cap) requires a variance from the State of Maryland's final cover design specifications for landfill closure (Code of Maryland Regulations [COMAR] 26.04.07.21 and COMAR 26.04.07.22). The variance (COMAR 26.04.07.26) was requested because a soil cover would prevent contact of human and ecological receptors with landfill debris as effectively as a RCRA Subtitle D cap, and because there are no current or reasonable future exposure pathways to shallow groundwater immediately downgradient of the landfill for human or environmental receptors. Even though there were exceedances of the MCLs in groundwater downgradient from the landfill, the surficial groundwater downgradient from the landfill would be Class III groundwater if drinking-water extraction wells were installed, therefore MCLs are not applicable. In addition, a RCRA Subtitle D cap would not prevent groundwater from being in direct contact with landfill waste, because the water table is primarily controlled by the water level of the Patuxent River and not by the amount of surface water infiltration. As a result, a RCRA Subtitle D cap would not reduce risks to human health or the environment to a significantly greater extent than a soil cover. Groundwater would continue to be monitored under Alternative 2 to ensure that contaminant levels do not increase significantly over current concentrations. The State of Maryland has granted the requested variance.

Alternatives 2 and 3 both meet ARARs pertaining to the protection of wetlands, including Section 404 of the Clean Water Act; 40 Code of Federal Regulations (CFR) Part 6; COMAR 26.23; COMAR 26.24, and Annotated Code of Maryland, Environment Article, Title 16. A complete list of the ARARs, including the prerequisites for applicability and an explanation of the specific remedy component affected, is set forth in Appendix D.

2.10.2 Primary Balancing Criteria

2.10.2.1 Long Term Effectiveness and Permanence

Alternatives 2 and 3 would be effective in the long term. Alternative 3 may be slightly more effective in the long term than Alternative 2 because of the increased protection from surface water infiltration that Alternative 3 would provide to groundwater beneath the Sites 1 and 12 landfills. However, the reduction of surface water infiltration may not improve long-term groundwater quality significantly, since groundwater already comes in contact with the landfilled wastes. In addition, there is no significant exposure pathway to

groundwater, Both Alternatives 2 and 3 would reduce the risk associated with debris in the ravine (Area C) because contaminated materials in this area would be excavated. Land use restrictions and long-term monitoring would reduce residual risk by preventing future disturbances of capped media and by monitoring for contaminant migration, respectively. A RCRA Subtitle D cap or vegetated soil cover over Sites 1 and 12, however, would not remove contaminated material from these areas. The long-term effectiveness and permanence of Alternatives 2 and 3 would depend on the long-term maintenance of the cap or soil cover.

2.10.2.2 Reduction in Toxicity, Mobility, or Volume through Treatment

Alternatives 2 and 3 would not use treatment to reduce the toxicity, mobility, or volume of the landfill materials, due to the heterogeneity of the landfill contents. Although Alternative 3 (RCRA cap) would provide more protection from infiltration than Alternative 2 (soil cover), groundwater quality under Alternatives 2 and 3 would not differ greatly because landfill waste already extends below the water table.

2.10.2.3 Implementability

Alternative 2 would be easier to implement than Alternative 3. Under Alternative 3, a specialty contractor would be required to install a RCRA Subtitle D cap. Such a contractor would not be required to construct the vegetated soil cover described in Alternative 2. Land use restrictions and 5-year site reviews would be required for all alternatives because contaminated material would remain onsite following remedial action.

2.10.2.4 Short-Term Effectiveness

Alternatives 2 and 3 would potentially expose workers to contaminated material and debris. Under both alternatives, a significant amount of construction activity, including excavation, handling of construction debris, surface debris, and soil will be required, so the potential for fugitive dust and impacts from air emissions would exist. Exposure risk will be minimized by wearing personal protective equipment (PPE) and by implementing dust and emission controls. Implementation of these alternatives would result in minimal increased risk to the surrounding community and ecosystems over current conditions because landfill contents will remain in place.

2.10.2.5 Cost

The estimated present-worth costs of Alternatives 2 and 3 are as follows:

Alternative 2: $ 4,650,000

Alternative 3: $ 8,580,000

2.10.3 Modifying Criteria

2,10.3.1 State of Maryland Acceptance

The MDE has reviewed the Proposed Remedial Action Plan and has concurred with the preferred remedial action, Alternative 2. Appendix A contains the state letter of concurrence along with state approval of the request for a variance from state solid waste regulations.

2.10.3.2 Community Acceptance

The preferred alternative and other alternative's considered in the FS were presented to the public on November 1, 1999. Comments obtained during the public meeting, held on November 9, 1999, and the 30-day comment period are presented in the Responsiveness Summary (Section 3.0). No community members expressed dissatisfaction with the preferred alternative.

2.11 Principal Threat Waste

Principal threat wastes are source materials that are considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur *(A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Documents;* EPA, 1999). Based on this definition and the results of the human health and ecological risk assessments, principal threat wastes are not present within OU-1. The following evidence supports this statement:

1. The human health risk assessment found no carcinogenic risks associated with wastes at Sites 1 and 12 above EPA's acceptable range. Non-cancer risks identified for groundwater in the area are considered to be negligible because there is no reasonable human exposure scenario for contaminated groundwater.

2. The screening-level ERA found no ecological risks within OU-1. Potential risks associated with surface water and sediment in Area E will be addressed as OU-2 and are not addressed by this ROD.

3. Source materials in Sites 1 and 12 can be contained in a reliable manner. Containment is a common remedial approach for landfills such as those present at Sites 1 and 12.

2.12 Selected Remedy

The selected remedy for Sites 1 and 12 is Alternative 2: Institutional Controls and Longterm Monitoring; Installation of a Soil Cover over Areas B and D; Excavation of Contaminated Material and Debris from Area C, and Offsite Disposal. A schematic of the selected remedy is displayed in Figure 2-6.

2.12.1 Summary of the Rationale for the Selected Remedy

Alternative 2 was selected as the remedy for Sites 1 and 12 because it offers the best balance of the nine NCP criteria, based on available information and a current understanding of site conditions. Alternative 2 is protective of human health and the environment because it prevents exposure to landfill wastes through the construction of a soil cover over Sites 1 and 12. The selected alternative is readily implementable and cost-effective. The construction of a soil cover, instead of a more elaborate RCRA Subtitle D cap, reduces construction and O&M costs while maintaining a similar level of effectiveness. The selected alternative considers the public's desire for restoring limited recreational use of Sites 1 and 12. Stabilization measures along the northwestern portion of Site 1 will allow for public access while maintaining habitat in the area.

2.12.2 Description of the Selected Remedy

Under Alternative 2, a soil cover with minimum 2 percent and maximum 3 horizontal: 1 vertical side grades will be placed over the landfill areas of Sites 1 and 12. The soil cover will consist of a minimum of 18 inches of subsoil and minimum 6 inches of topsoil capable of supporting vegetative growth. The base for the soil cover will be obtained from the area east of Site 1 (Area F). Approximately 2.6 acres of wetlands will be eliminated in Site 1 as a result of installing the soil cover. In addition, approximately 1 acre of the marsh west of Site 12 will be disturbed during the installation of the soil cover. These emergent wetlands will be mitigated, one-for-one, elsewhere on the NAS. Surface debris and contaminated soil will be excavated from a ravine (Area C) and disposed in an offsite permitted landfill. Shoreline stabilization will be implemented along the northwestern portion of Site 1, in order to stabilize current erosion.

Institutional controls will consist of the following: (1) access restrictions to prevent trespassing and disturbance to the soil cover, and (2) deed notices and land use controls to limit site development and access to groundwater. Monitoring will be performed to assess the migration of contaminants into the environment and to evaluate the effectiveness of the remedy. Routine operation and maintenance activities will be performed to promote long-term stability of the soil cover. A review will be conducted every 5 years to evaluate whether human health and the environment continue to be protected.

2.12.3 Summary of the Estimated Remedy Costs

A detailed breakdown of costs associated with Alternative 2 is presented in Appendix E. The information provided in the cost estimate is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences (ESD), or a ROD amendment. The cost estimate provided in Appendix E is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost. The cost estimate is based on a 5 percent discount rate and 30-year duration.

2.12.4 Expected Outcomes of the Selected Remedy

Alternative 2 will allow for pedestrian access to Sites 1 and 12 for limited recreational use. Stabilization measures along the northern portion of the western shoreline of Site 1 will preserve habitat along the shoreline to the extent possible, while maintaining access to the western shore for limited recreational use. The amount of time that access to the shoreline will be blocked due to construction will be approximately 12-18 months. Land use restrictions will be implemented to prevent disturbance of the soil cover material overlying waste in Areas B and D.

Groundwater within the surficial aquifer beneath Sites 1 and 12 will not be used for drinking water purposes. St. Mary's County prohibits the installation of drinking water wells within the surficial aquifer.

2.12.5 Performance Standards of the Selected Remedy

Performance standards for the selected remedy, described above, fall under six general categories:

1. Institutional Controls
2. Soil and Debris Removal and Disposal
3. Vegetated Soil Cover
4. Shoreline Stabilization
5. Site Monitoring
6. Wetland Mitigation

Performance standards related to each of these categories are discussed below.

2.12.5.1 Institutional Controls

Under the selected remedy, institutional controls at Sites 1 and 12 shall be implemented to limit future site land use. The selected remedy is not designed to protect human health if Sites 1 and 12 are used for residential purposes. Accordingly, unless the remedy selected in this ROD is revisited and all necessary steps, including additional response actions, are taken to protect human health and the environment, NAS Patuxent River shall prohibit, except as provided below:

- Future excavation and any other activity that would disturb the integrity of the soil cover overlying the Sites 1 and 12 landfills;

- Access to groundwater underlying Sites 1 and 12; and

- Residential use of Sites 1 and 12.

Land Use Control Implementation Plan: NAS Patuxent River shall develop, in consultation with EPA and MDE, a Land Use Control Implementation Plan (LUCIP). The LUCIP shall include a description of Sites 1 and 12, including a map, a description of its size, and a description of the contaminants of concern; the land use controls selected above; the particular mechanisms to implement these controls; a reference to this ROD; and any other pertinent information.

Assuring Continued Effectiveness of Land Use Control: The Navy, MDE, and EPA intend to negotiate a Land Use Control Assurance Plan (LUCAP) in the near future, which will establish procedures for ensuring that the land use controls for Sites 1 and 12 and all other IR sites at Patuxent River Naval Air Station remain effective and protective in the long-term. In the meantime, NAS Patuxent River shall implement the procedures outlined below to ensure the continued effectiveness of the land use controls for Sites 1 and 12.

NAS Patuxent River shall conduct an annual visual inspection of Sites 1 and 12 to verify that the land use controls for these sites have been implemented and are being properly maintained. NAS Patuxent River shall promptly notify EPA and MDE of any deficiencies noted, any corrective measures taken or to be taken, and the schedule for taking such corrective measures.

In addition to a visual inspection, NAS Patuxent River shall annually review the status of the land use controls for these sites. Any non-compliance issues will be appropriately resolved with EPA and MDE.

The U.S. Navy shall annually prepare and forward to EPA and MDE a report, signed by the Commanding Officer, certifying the continued retention of the land use controls for Sites 1 and 12.

The above requirements for inspecting, reviewing, and certifying the continued effectiveness of land use controls at Sites 1 and 12 are intended to be in addition to, and not a replacement for, requirements in the Operation and
Maintenance (O&M) Plan for the remedy selected in this ROD. An O&M Plan will be developed for this remedy.

At least 60 days (except in emergency situations) prior to implementation of any major change in land use at Sites 1 and 12, NAS Patuxent River shall notify EPA and MDE of the contemplated change. The notification shall be provided to obtain EPA's concurrence and MDE's support of the NAS Patuxent River's determination as to whether the contemplated change will or will not necessitate the need for re-evaluation of the selected remedy or implementation of specific measures to ensure continued protection of human health and the environment.

NAS Patuxent River also agrees to immediately notify EPA and MDE if, despite its best efforts to ensure compliance with the land use controls for Sites 1 and 12, any major change in land use at Site 1 and 12 is discovered which has not been previously reviewed by EPA and MDE. Such notifications will provide all pertinent information as to the nature and extent of the change and describe any measures implemented or to be implemented, including a timetable for future completion, to reduce or prevent human health or ecological impacts.

2.12.5.2 Soil and Debris Removal and Disposal

The selected remedy calls for the removal of soil and debris from Area C, a ravine adjacent to Site 12. Debris will be removed from Area C and disposed in an offsite RCRA Subtitle D (non-hazardous waste) permitted landfill. If found necessary, based on sampling and analysis results, soil will also be removed from Area C to the extent required to protect human health and the environment.

2.12.5.3 Vegetated Soil Cove

The selected remedy calls for a compacted soil cover to be constructed over the Fishing Point and Rifle Range Landfills (Areas B and D). The soil cover will consist of a minimum of 6 inches of topsoil and minimum 18 inches of vegetative support soil. The cover shall be graded with grades of at least 2 percent and no more than 3:1, and surface water controls shall be implemented to manage stormwater runoff. Landfill contents extending beyond the limits of the soil cover (i.e., the northwest corner of Area B) will be excavated and placed beneath the soil cover. Landfill gas will be collected in a passive gas collection system and vented to the atmosphere.

An O&M Plan will be prepared and reviewed by EPA and MDE. The O&M Plan will outline the frequency and scope of the inspections, erosion and sedimentation control

measures, stormwater management procedures, maintenance, reporting requirements, sampling frequency, contingency measures, and other pertinent aspects.

2.12.5.4 Shoreline Stabilization

Stabilization measures will be implemented along a portion of the western shoreline of Fishing Point to minimize erosion of the Fishing Point Landfill, protect the soil cover, preserve habitat along the shoreline to the extent possible, and maintain access to the western beach for recreational use. The design of the shoreline stabilization will be integrated into the vegetated soil cover design to prevent damage to the soil cover in the event of a severe storm.

2.12.5.5 Site Monitoring

Groundwater monitoring will be conducted. Routine inspections of the soil cover and vegetation shall be conducted to identify and repair erosion-related damage to the cover.

2.12.5.6 Wetland Mitigation

Wetlands impacted as a result of soil cover construction will be mitigated as part of this remedial action. The design for wetland mitigation will be prepared as an addendum to the design for the landfill cover.

2.13 Statutory Determinations

Remedial actions must meet the following statutory requirements of CERCLA Section 121:

1. Protection of human health and the environment

2. Compliance with ARARs (or justification of a waiver)

3. Cost effectiveness

4. Utilization of permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable

5. Preference for treatment that reduces toxicity, mobility, or volume as a principal element, or explanation as to why this preference is not satisfied

A discussion of how the selected remedy satisfies each of these statutory requirements is provided in the following subsections.

2.13.1 Protection of Human Health and the Environment

The selected remedy will protect human health and the environment. A vegetated soil cover over Sites 1 and 12 will minimize direct contact of human and ecological receptors with contaminated landfill contents, and the soil cover would reduce transport of contamination from the landfill contents to groundwater. Short-term risks associated with exposure to contaminated soil during excavation, transportation, and disposal will be minimized through safe work practices and the use of PPE.

2.13.2 Compliance with ARARs

Chemical-specific ARARs

No chemical-specific ARARs were identified for Sites 1 and 12, OU-1, since the only potential risks identified in the human health and ecological risk assessments were identified in groundwater, which does not have a reasonable exposure pathway to potential receptors.

Location-specific ARARs

The selected remedy complies with each of the location-specific ARARs listed in Appendix D.

Action-specific ARARs

Under the selected remedy, the construction of a vegetated soil cover requires a variance from one action-specific ARAR: the State of Maryland's final cover design specifications for landfill closure (COMAR 26.04.07.21 and COMAR 26.04.07.22). The variance (COMAR 26.04.07.26) is justified because a soil cover would prevent contact of human and ecological receptors with landfill debris as effectively as a RCRA Subtitle D cap, and because there are no current or reasonable future exposure pathways to shallow groundwater for human or ecological receptors. MDE has granted the requested variance.

The selected remedy also will meet ARARs pertaining to the protection of wetlands, including Section 404 of the Clean Water Act; 40 CFR Part 6; COMAR 26.23; COMAR 26.24; and Annotated Code of Maryland, Environment Article, Title 16.

2.13.3 Cost Effectiveness

The selected remedy addresses contamination at Sites 1 and 12 in a cost-effective manner. Although a RCRA Subtitle D cap, included in Alternative 3, would reduce surface water infiltration more effectively than a soil cover under the selected remedy, the RCRA cap is unlikely to greatly improve overall groundwater quality because some of the waste in the landfill lies below the water table. A potential reduction in groundwater contamination does not appear to justify the substantial additional cost of a RCRA cap, because there is no viable human exposure pathway for groundwater, and groundwater contamination does not pose a risk to ecological receptors.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Possible

The selected remedy will be effective in the long term. The long-term effectiveness of the vegetated soil cover over Sites 1 and 12 will depend in large part on maintenance of the soil cover.

Due to cost constraints, alternative treatment and resource recovery technologies are not included in the selected remedy.

2.13.5 Preference for Treatment as a Principal Element

The selected remedy does not employ treatment to reduce the toxicity, mobility, or volume of contaminated materials at Sites 1 and 12. Treatment at these sites would be costprohibitive due to the widespread extent of contamination throughout the landfills. In addition, treatment of contaminated materials in Area C was not included in the selected remedy because of the cost savings realized by excavating and disposing of these materials in an offsite landfill.

2.14 Documentation of Significant Changes

One significant change was made to the selected remedy, Alternative 2, since the completion of the FS report. Because the marsh west of Site 12 was separated out of OU-1 after the FS was completed, remedial actions for the marsh are no longer included in the selected remedy. The marsh will be addressed at a later date, following the completion of additional ecological study in the area.

The only change made to the alternative recommended in the PRAP was the addition of a passive landfill gas collection system, rather than allowing landfill gases to dissipate through the soil cover. This system was added in order to ensure that landfill gases do not collect beneath low-permeability areas of the soil cover, potentially resulting in damage to the soil cover or subsurface migration of landfill gases away from the landfills. A passive gas collection system was selected because the Fishing Point and Rifle Range landfills are not expected to produce large quantities of gases. An active gas collection system, generally used for larger quantities of gas production, would require installation of a flare, which would be expensive to install and expensive to maintain. The passive system will minimize operations and maintenance requirements and have a lower risk of mechanical failure.

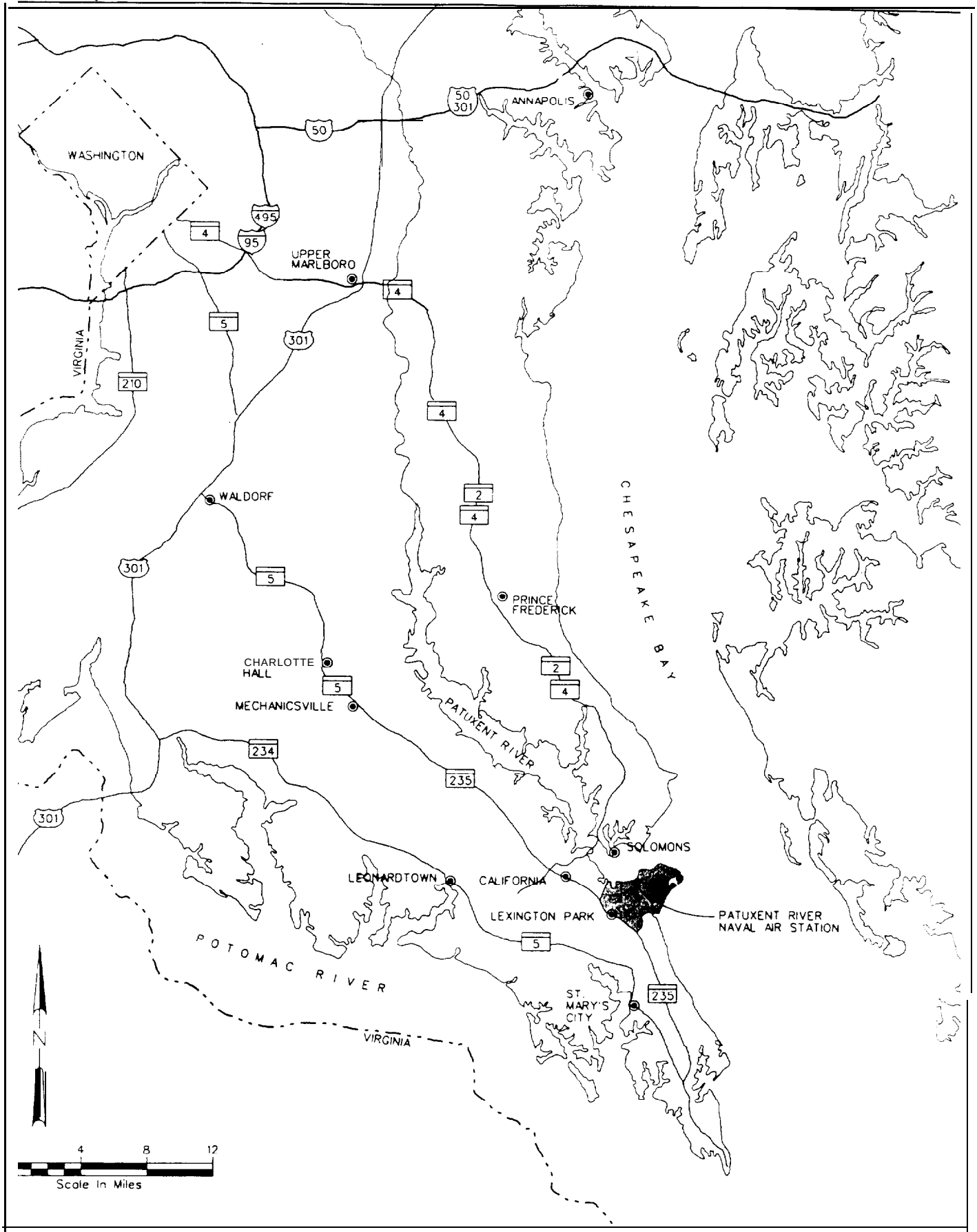
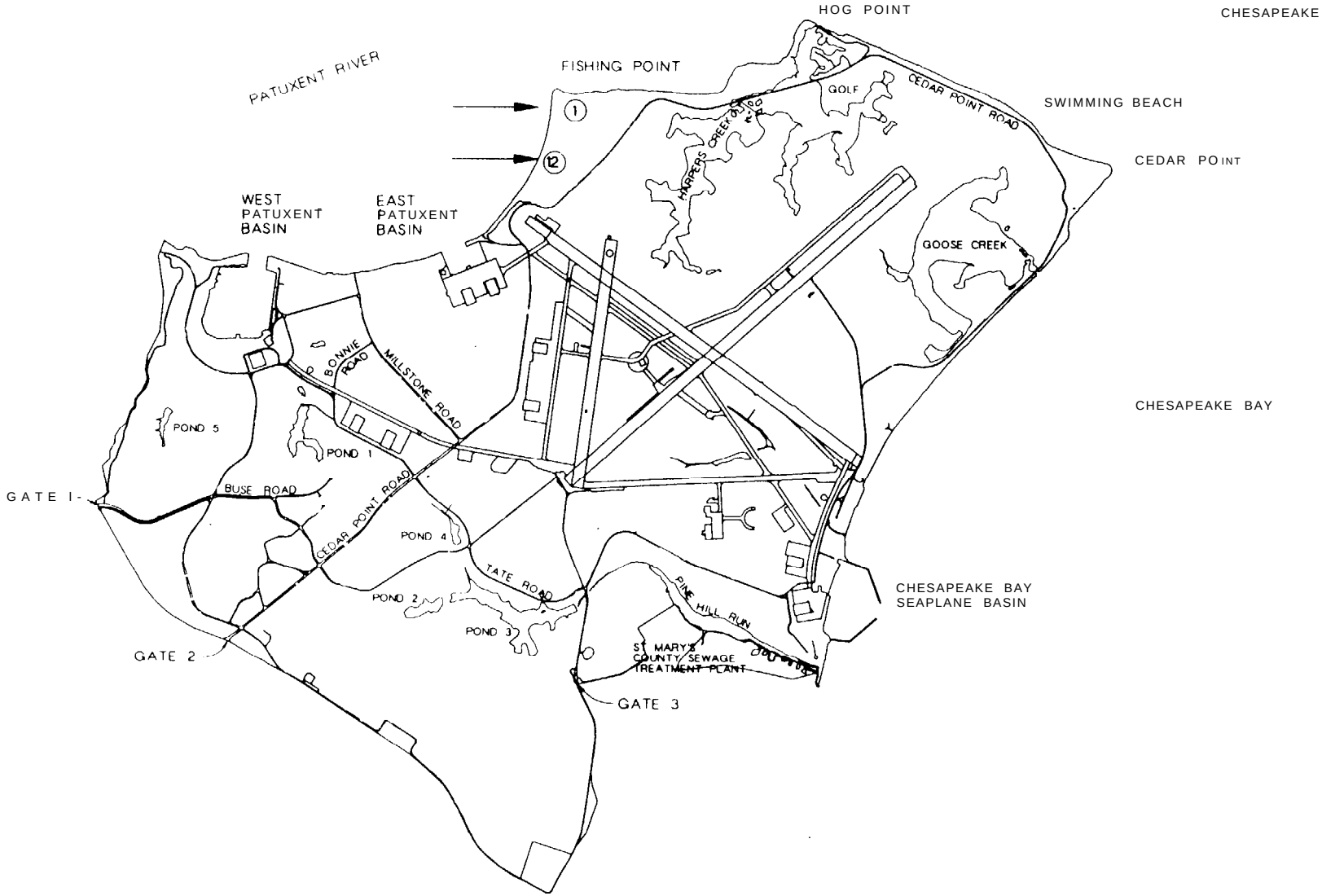


Figure 2-1
MAP OF PATUXENT RIVER
NAVAL AIR STATION AND VICINITY
Naval Air Station Patuxent River



LEGEND

(1) SITE 1 - FISHING POINT, ANDREL
(12) SITE 12 - RIFLE RANGE, ANDREL

Figure 2-2
LOCATION OF SITES 1 AND 12
Naval Air Station Patuxent River

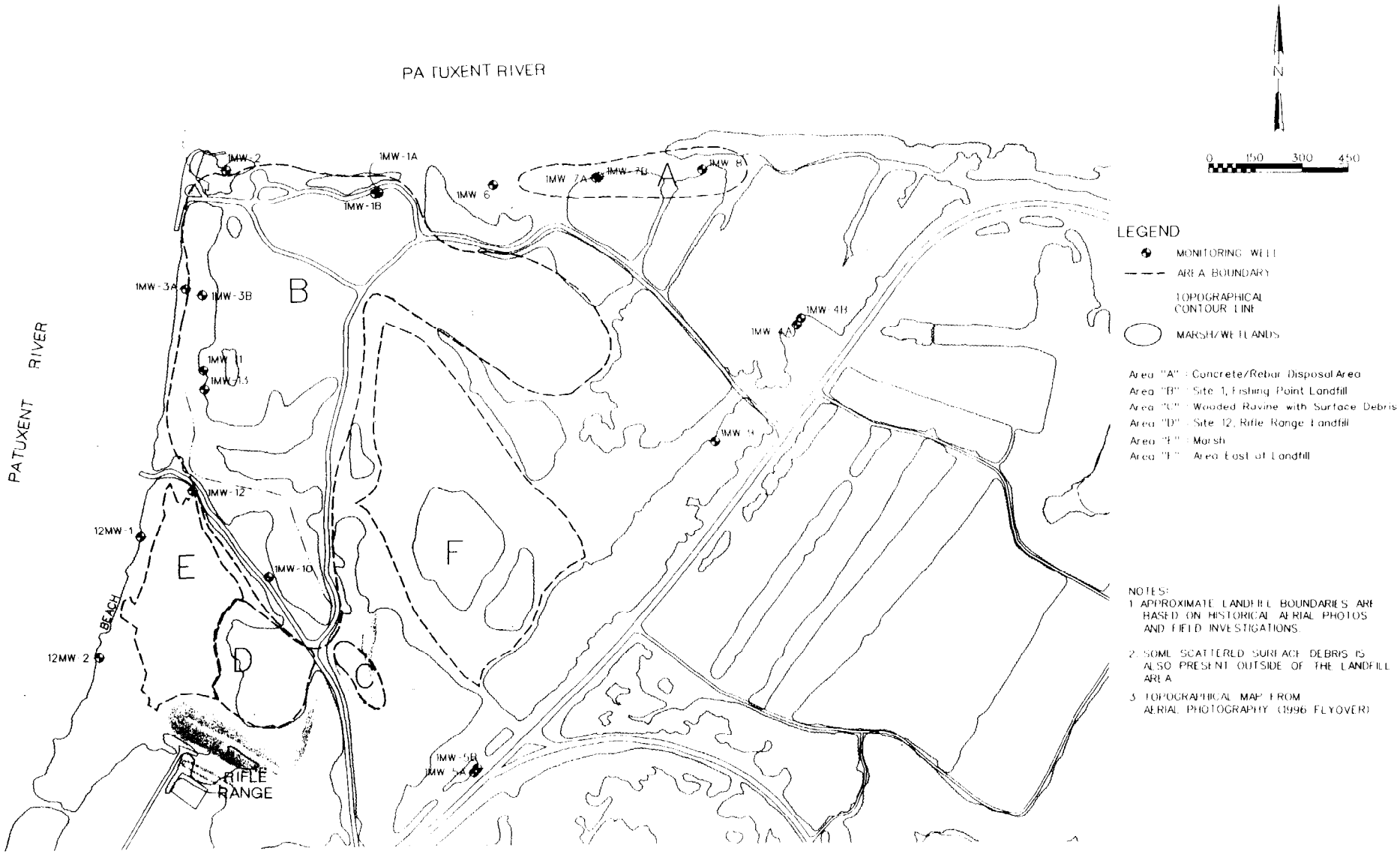


Figure 2-3
AREAS INVESTIGATED
SITE 1 AND SITE 12
Naval Air Station Patuxent River

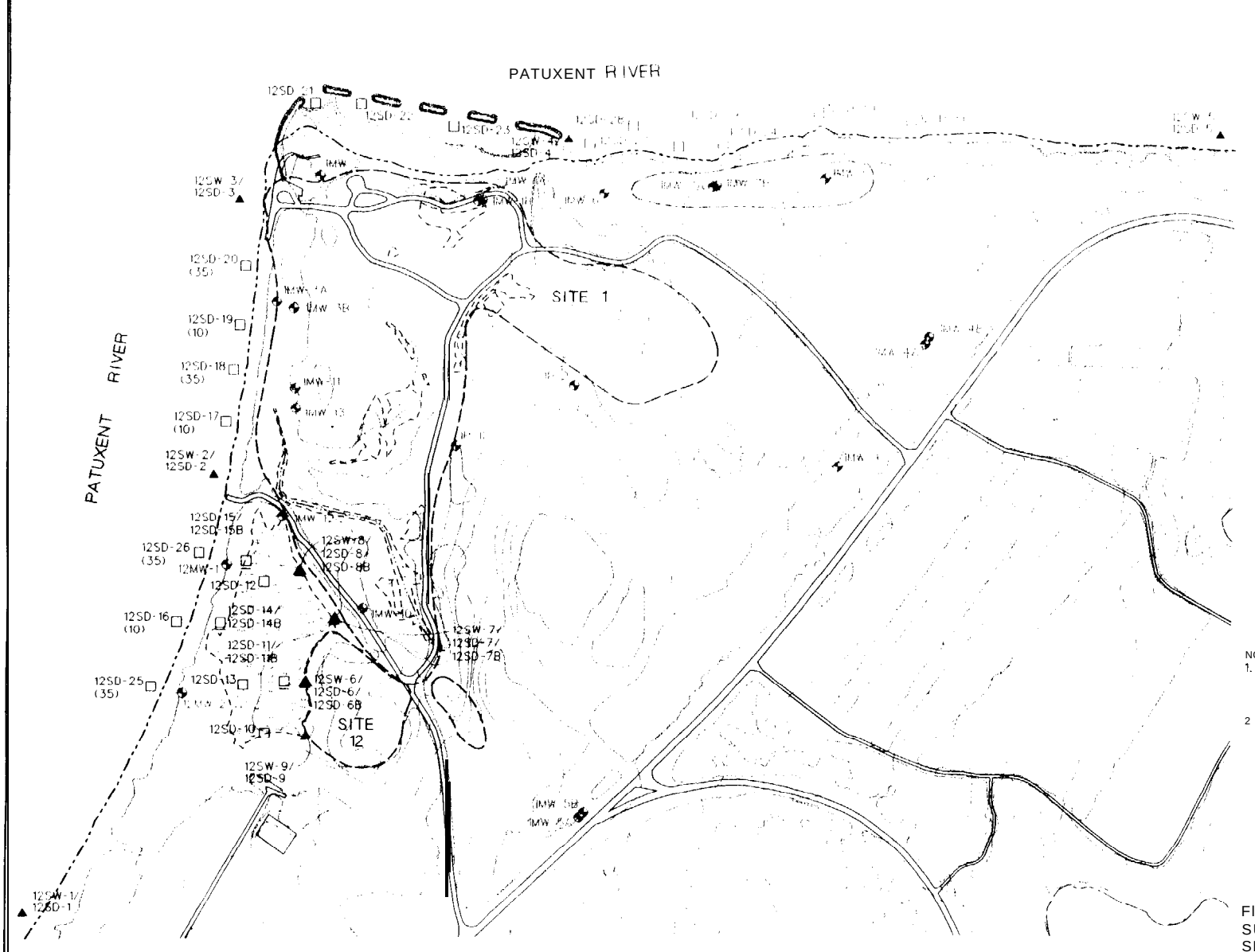


Figure 2-4
SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS
SITE 1 AND SITE 12
Naval Air Station Patuxent River

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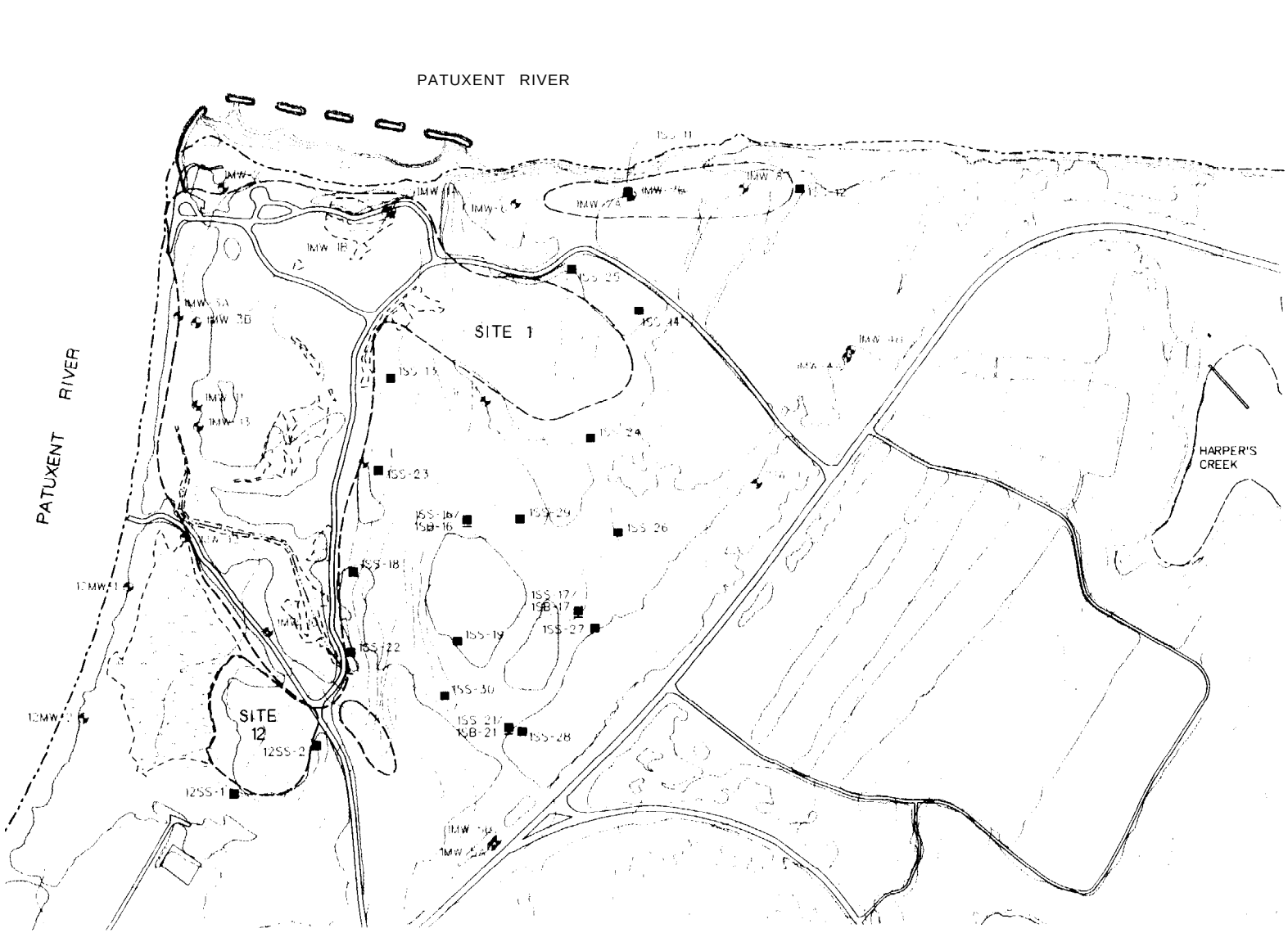

Figure 2-5
SOIL SAMPLING LOCATIONS
SITE 1 AND SITE 12
Naval Air Station Patuxent River

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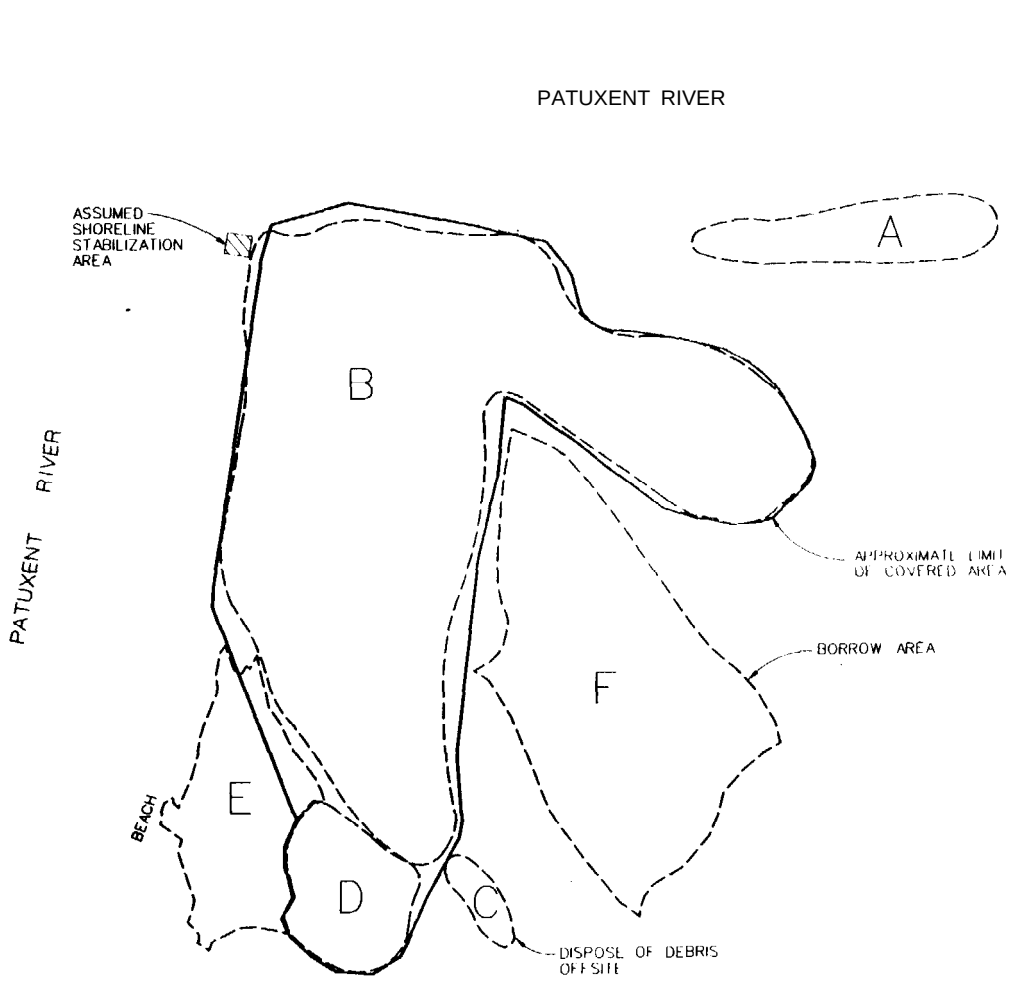

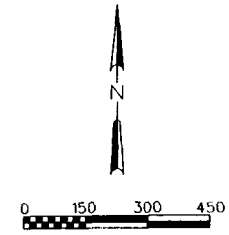

LEGEND

PROPOSED LIMITS OF LANDFILL SOIL COVER

--- AREA BOUNDARY

0 MARSH/WETLANDS

ASSUMED AREA OF SHORELINE STABILIZATION

NOTES:

1. APPROXIMATE LANDFILL BOUNDARIES ARE BASED ON HISTORIC& AERIAL PHOTOS AND FIELD INVESTIGATIONS
2. SOME SCATTERED SURFACE DEBRIS IS ALSO PRESENT OUTSIDE -OF THE LANDFILL AREA.
3. SOIL WILL BE EXCAVATED FROM AREA F TO BE USED AS GENERAL FILL BENEATH THE SOIL COVER IN AREAS B & D

Figure 2-6
DETAIL OF PREFERRED ALTERNATIVES FOR SITE 1 AND SITE 12
Naval Air Station Patuxent River

3.0 Responsiveness Summary

As described in Section 2.10, remedial alternatives for OU-1 were evaluated against seven of the nine evaluation criteria identified in the NCP at 40 CFR Section 300.430(e)(9). The last two of the nine evaluation criteria in the NCP are State Acceptance and Community Acceptance. The Responsiveness Summary is a concise and complete summary of state and community acceptance. The Responsiveness Summary provides the lead agency (U.S. Navy) with information on the views of the community. It also documents how the lead agency has considered public comments during the decision-making process and provides answers to major comments. This Responsiveness Summary was prepared after the public comment period, which ended on November 30, 1999, in accordance with the guidance document, *Community Relations in Superfund: A Handbook* (Office of Solid Waste and Emergency Response [OSWER] Directive 9230.0-3B, January 1992).

3.1 Stakeholder Issues and Lead Agency Responses

A public meeting was held on November 9, 1999 at the Frank Knox Training Center, located at NAS Patuxent River. The proposed remedial action plan for Sites 1 and 12 was presented at the public meeting. A transcript of the public meeting is provided in Appendix B.

No community members expressed dissatisfaction with the Navy's preferred alternative, Alternative 2. A few questions were raised during the meeting, and most were answered thoroughly during the meeting as documented in Appendix B. The community concerns have been studied, and responses are provided below.

1. **Is contaminated groundwater discharging into the Patuxent River?**

Navy Response: Shallow groundwater beneath and downgradient of the landfills has been contaminated by leachate from the landfills. This groundwater is discharging into the Patuxent River. Levels of contamination in groundwater are very low (in the parts per billion range), and are significantly diluted by the large volume of flow in the Patuxent River. Samples of surface water from the Patuxent River also were collected. Analytical results from surface water sampling, provided in Chapter 4 of the Remedial Investigation Report for Site 1 and Site 12, showed that there were no unacceptable levels of contamination in the Patuxent River.

2. **How can you be sure that groundwater is flowing toward the Patuxent River and not toward shallow drinking water wells maintained by the Amish?**

Navy Response: Water levels have been monitored on numerous occasions in the network of monitoring wells at the sites. These water levels show that groundwater flow in the shallow aquifer in this area is consistently toward the river.

3. **Is the landfill trash submerged in water? If so, how deep?**

Navy Response: Landfill trash is submerged in water. The thickness of trash below the water table varies depending on the time of year and amount of rainfall that has been

received, as these factors affect the water level. During the Remedial Investigation, at least 12 inches of trash were observed below the water table at most locations, but the precise thickness of trash could not be determined during the test pit excavation because test pit walls were unstable below the water table.

4. Why has the location for wetlands mitigation not yet been identified?

Navy Response: Identification of the ideal location for wetlands mitigation is currently on hold. Our hope is that we can complete the ecological study at Area E (OU-2) quickly, so that any mitigation requirements from the remedy at OU-2 can be combined with mitigation of the wetlands on top of the landfills. This will allow construction of a larger wetland, if appropriate, rather than two smaller wetlands. Combining the mitigation efforts in this way is more likely to result in successful establishment of a functioning wetland.

Glossary

Administrative Record — A body of documents that form the basis for the selection of a CERCLA response action and which are made available to the public to provide the public with the opportunity to participate and comment on the selection process.

Aquifer — A body of rock or soil that is sufficiently permeable to conduct groundwater and to yield economically significant quantities of water to wells and springs.

ARARs — Applicable or Relevant and Appropriate Standards, Limitations, Criteria, and Requirements— These are federal or state environmental rules and regulations.

Brackish Water — Water with a salinity intermediate between that of normal seawater and that of normal freshwater.

CERCLA — Comprehensive Environmental Response, Compensation, and Liability Act (1980) — Also known as the Superfund Law, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), CERCLA provides the organizational structure and procedures for responding to releases of hazardous substances, pollutants, and contaminants from inactive hazardous waste disposal sites.

Class III Groundwater — Groundwater that is classified as "Class III" has a total dissolved solids content of greater than 10,000 parts per million (ppm), rendering it nonpotable.

COPC — Contaminant of Potential Concern — Chemical compounds identified early in the risk assessment process that may pose a risk to human health and the environment at detected concentrations.

Downgradient — Toward the bottom of a slope, or in the direction of groundwater flow.

Ecological Receptors — Living organisms (other than humans and domesticated animals) that could be affected by a contamination in the environment.

Ecological Risk Screening — The qualitative evaluation to assess the risk posed to ecological receptors by the presence, potential presence, and/or use of specific COPCs.

EPA — United States Environmental Protection Agency.

Exposure Pathway — A way that a person, plant, or animal may be exposed to a COPC. For example, drinking contaminated water may be an exposure pathway for an animal.

FS — Feasibility Study — Analysis of the practicability of a proposal; e.g., a description and analysis of potential cleanup alternatives for a site such as one on the National Priorities List. The feasibility study usually recommends selection of a cost-effective alternative. It usually starts as soon as the remedial investigation is under way. Together they are commonly referred to as the "RI/FS."

Groundwater — Water that is found below the ground surface.

HI — Hazard Index — A number indicative of noncarcinogenic health effects, which is the ratio of the existing level of exposure to an acceptable level of exposure. A value equal or less than one indicates that the human population is not likely to experience adverse effects.

HQ — Hazard Quotient — The ratio of a single substance exposure level over a specified time period to a reference dose for that substance derived from a similar exposure period.

Human Health Risk Assessment — The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health by the presence or potential presence and/or use of a specific COPC.

Human Nutrient — For the human health risk assessment, human nutrients are identified as calcium, magnesium, potassium, and sodium.

Hydraulic Conductivity — Property of soil or rock characterizing the rate at which water can flow through the material.

Installation Restoration (IR) Program — A component of the Defense Environmental Restoration Program created under CERCLA regulations and funded by the Department of Defense. The purpose of the program is to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operations and hazardous material spills at military activities.

Institutional Controls — Administrative methods to prevent human exposure to contaminants, such as by restricting land development.

IRI — Interim Remedial Investigation — Similar to a Remedial Investigation, but carried out prior to listing on the NPL. An in-depth study designed to gather data needed to determine the nature and extent of contamination at a site, establish site cleanup criteria, identify preliminary alternatives for remedial action, and support technical and cost analyses of alternatives.

MCLs — Maximum Contaminant Levels — The enforceable primary drinking water standards under the Safe Drinking Water Act (SDWA) with which public water systems must comply.

MDE — Maryland Department of the Environment.

Media — Soil, groundwater, surface water, sediment, or ambient air, at a site.

Monitoring Well — 1) A well used to obtain water quality samples or measure groundwater levels. 2) A well drilled at a hazardous waste management facility or Superfund site to collect groundwater samples for the purpose of physical, chemical, or biological analysis to determine the amounts, types, and distribution of contaminants in the groundwater beneath the site.

NCP — National Oil and Hazardous Substances Pollution Contingency Plan-Provides the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants.

NPL — National Priorities List — Nationwide list (developed by EPA) that identifies sites covered under CERCLA regulations for priority investigation and remedial action.

OU — Operable Unit — Term for each of a number of separate activities undertaken as part of a Superfund site cleanup. For example, cleanup of soil and groundwater could be two separate operable units.

Performance Standards — Criteria that must be met by the selected remedial alternative in order to ensure that the action meets all remedial action objectives, including protection of human health and the environment.

Present-Worth Cost — Total cost, in current dollars, of the remedial action. The present-worth cost includes capital costs required to implement the remedial action, as well as the cost of long-term operations, maintenance, and monitoring.

Public Comment Period — The time allowed for the members of an affected community to express views and concerns regarding an action proposed to be taken by the government, such as a rulemaking, permit, or Superfund remedy selection.

RA — Remedial Action — The phase that involves the construction, operation, and implementation of the remedy to clean up the site.

RAB — Restoration Advisory Board— An advisory board, consisting of community members, designed to act as a focal point for the exchange of information between the NAS and the local community regarding environmental restoration activities.

RAOs — Remedial Action Objectives — The objectives of remedial actions developed based on contaminated media, contaminants of concern, potential receptors and exposure scenarios, human health- and ecological-risk assessment, and attainment of regulatory cleanup levels, if any exist.

RCRA — Resource Conservation and Recovery Act — A 1976 regulation of the management of hazardous waste to ensure the safe disposal of wastes. The intent of the RCRA program is to protect public health and the environment by controlling hazardous waste.

Reference Dose — An estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime.

Removal Action — 1) An action to abate, minimize, stabilize, remove, or eliminate the release or threat of release of a hazardous substance, pollutant, or contaminant. 2) The cleanup or removal of hazardous substances, pollutants, and/or contaminants from the environment.

RI — Remedial Investigation — The RI is prepared to report the type, extent, and potential for transport of contaminants of potential concern at a hazardous waste site.

ROD — Record of Decision — A ROD is a public document which explains the cleanup alternative to be used at a CERCLA site. The ROD is based on technical and financial analyses generated during the RI/FS and on consideration of the public comments and community concerns.

Sediment — Solid material transported by water that is deposited in layers along channels of flow.

Slope Factor — A plausible upper-bound estimate of the probability of a human physiological response per unit intake of a chemical over a lifetime. The slope factor is used to estimate an upper-bound probability of an individual developing cancer as a result of a lifetime of exposure to a particular level of a potential carcinogen.

Surface Water — Water that occurs on the ground surface, usually in the form of a lake, stream, river, or other body of water.

SVOC — Semivolatile Organic Compound — One of a group of organic compounds composed primarily of carbon and hydrogen that are characterized by their low volatility. SVOCs include substances that are contained in hydrocarbon products like asphalt, oil, and tar.

TAL — Target Analyte List — A list of inorganic compounds (metals and cyanide) which EPA has identified for use in assessing potential hazards at CERCLA sites.

TCL — Target Compound List — A list of organic compounds including VOCs, SVOCs, pesticides, and PCBs which EPA has identified for use in assessing potential hazards at CERCLA sites.

VOC — Volatile Organic Compounds — A group of organic compounds composed primarily of carbon and hydrogen that are characterized by their tendency to readily evaporate (or volatize) into the air from water or soil. VOCs include substances that are contained in common fuels, solvents, and cleaning fluids.

Vegetative Support Material — A portion of the soil cover, just beneath the topsoil, that is sufficiently porous to provide a base for grasses and other plants that may be seeded on top of the soil cover.

Water Table — The surface between the zone of saturation and the zone of aeration; the surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere.

Wetlands— An area of land characterized by swamps, marshes, or flora and fauna that prefer wet environments.

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MDE

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Parris N. Glendening
Governor

Jane T. Nishida
Secretary

January 27, 2000

Mr. Bayly Smith
Naval Air Station
22445 Peary Road – PVD Mailstop 28
Patuxent River MD 20670-5309

RE: Record of Decision for Operable Unit 1, Site 1, Fishing Point Landfill and Site 2, Rifle Range Landfill, Patuxent River Naval Air Station

Dear Mr. Smith:

The Maryland Department of the Environment, Waste Management Administration (MDE/WAS) has completed its review of the above-referenced document. This Record of Decision documents the Navy's decision to install a soil cover on Sites 1 and 12, which are former disposal areas in the Fishing Point area of the Patuxent River Naval Air Station. The Navy is conducting this action in compliance with the Comprehensive Environmental Response, Compensation and Liability Act.

The soil cover is intended to prevent exposure of human and ecological receptors to the wastes and thereby mitigate the associated risks. This decision incorporates a variance to the State's landfill closure requirements for sanitary landfills, which was granted by the MDE/WAS in correspondence dated November 8, 1999.

Based upon the acceptable level of protection to human health and the environment provided by the remedy, the Maryland Department of the Environment concurs with the selected remedy. If you have any questions, please contact me at (410) 631-3394.

Sincerely,

Kim Lemaster

Kim Lemaster
Section Head
Federal/NPL SuperfUrid, Division

KL:bjm

cc: Ms. Kim Parker
Mr. Andrew Sochanksi
Mr. Richard Collins
Mr. Karl Kalbacher

In The Matter Of:

SITE 1, FISHING POINT LANDFILL
SITE 12, LANDFILL BEHIND RIFLE RANGE

November 9, 1999

For The Record, Inc.
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Word Index included with this Min-U-Script®

Appendix A
Letter of Concurrence

Appendix B
Public Meeting Transcript

PROPOSED REMEDIAL ACTION PLAN
SITE 1, FISHING POINT LANDFILL
AND
SITE 12, LANDFILL BEHIND RIFLE RANGE
OPERABLE UNIT 1 - (AREAS A, B, C, S, AND F)
PUBLIC HEARING
NOVEMBER 9, 1999

The public hearing was taken on Tuesday, November 9, 1999, commencing at 6:42 p.m., at the Frank Knox Training Center, Patuxent River, Maryland before Mary Claire Ochsner-Hammond, Notary Public.

PROCEEDINGS

CAPTAIN ROBERTS: Good evening. I guess we'll go ahead and get started. I'd like to welcome everyone tonight. I'm pleased to have you hear. This to me is a special project and tonight we're having the public hearing on the proposed plan for the remediation of Site 1 and 12, commonly called Fishing Point.

We're really excited about this particular project going through the long process that we have to do to get to this stage. We're excited about it because what we've done in the past and also we're really looking to reutilize this location.

So, we're really pleased about where we've come with this and we're really looking forward to this project. It's one of the nicest places on the base, if it wasn't for the landfill, and we're going to address that.

So, I'm pleased that you're here. I

encourage your comments. Public comment questions of the alternatives are important. It's important that you clearly understand what the alternatives are and why we selected what we have and what our plans are. I'm pleased to have you here. And I'll turn it over to Donna Jordan who will start the brief.

MS. JORDAN: Good evening. How's everyone this evening? My name is Donna Jordan and I'm the outgoing remedial project manager for the Naval Air Station Patuxent River, Maryland. Kim Parker, to my right, is going to be taking over as going to the new project manager.

I know a couple months ago at the last proposed planning we introduced another individual who was going to be taking over, Jeff Waite. Jeff Waite has been reassigned to another project.

We were lucky to get Kim from the Army and she has a lot of experience in working with restoration sites. So, Kim is going to be taking over and she and I are going to do the

presentation together. So, you'll get a chance to hear from Kim as well this evening.

We're here to talk about the proposed plan for Sites 1 and 12, Fishing Point Landfill Sites and we're going to refer to that as Operable Unit 1. Okay. The proposed plan. The proposed plan is where the Navy presents to the public what our plans are to remedy a site.

We put together a document that describes what the action is that we plan to take at the site.

We also talk about the rationale for why we selected that alternative.

We also talk about human health and ecological potential risks that are out there and also give information as to where you can find supporting documentation, if you have questions about any of the past work that's been done at this site. And it's also our chance to get public participation into the decisions that were looking at for the site.

An overview of what we call the CERCLA or installation restoration process and that's

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the process for evaluating and remedying sites that were used as past disposal sites. We go from site discovery, we do some inspection. We do a feasibility study. Then we get to the proposed plan and the Record of Decision.

So, once we finish the proposed plan phase, then we must document the decision that we're planning to take at the site. We go from that to a design remedy and then implementing the remedy, which is called the remedial action. Then we monitor the remedy to make sure it's still effective.

Site background. For those of you who have been here for several years we've been working on this, just a refresher. Site 1 landfill had operated from 1960 to 1974. It served as the main disposal site for Pax River. Here's a list of some of the items that were placed into the landfill.

Site 12 was actually adjacent to Site 1. We're going to show you a map of those two sites and you can see that they are co-located.

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Actually, it was used a little bit earlier. It has some of the same materials placed in it. Site 12 is also adjacent to a marsh or a wetland area and I'll show you that on the map as we get further into the discussion.

A list of past activities we've done at this site. We started with the site, as far as putting the site in the program for investigation, back in 1984. Then we started doing some preliminary work in '85 and then on through various phases of the investigation.

In '93 we had a removal action where we took an interim type of action because we did have some landfill material that was going out to the river due to the erosion from all the storms that had come through. So, we did take removal action to take care of that. We just recently finished up the remedial investigation and also the feasibility study.

So, now we're in the proposed plan. Not a very good picture, but this is a picture from earlier when the landfill was in operation. I

Page 7

don't have a pointer, but here in the far corner is where the trash was placed, Site 1.

Now you can look at the shore and you're going to see the shoreline is going to change in the next couple of pictures. This is where we had to install the breakwaters as part of the removal action I mentioned that we had to take because we had landfill material coming out into the river. So, we had to build part of the beach back up and this is what it looked like when it was finished, with the breakwaters installed.

If you look up in that far corner where you see it's curved, we're experiencing some erosion in that area now. And that's an area we're going to take care of along with when we put in the remedy for the landfill site.

This is what it looks like now if you were to go out there. The beach grasses were planted. The natural resources persons – I think they have a group of students that come out and do some grass planting and then a couple years ago Captain Standridge had closed off

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access to the Fishing Point Landfill Area and this gave the grass a chance to grow.

So, this is what it would look like now if you had a chance to go out there. This is that corner that I was talking about earlier where we're experiencing some erosion over the years from the storms coming in. You can see the downed trees. So, we're going to be taking a look at that and fixing that up as part of the remedy.

From studying the landfill we've actually broken it up into several different areas. Area A, up at the top, is an area up on the hill and basically it's just what we consider clean fill. It's just concrete, rubble, debris up in that area.

The main landfill is Area B which is Site 1 and Area D is Site 12. Area E is the wetland that I mentioned or the marsh area that's adjacent to the landfill. Area C is just a little ravine area where we found some surface debris.

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Someone had come out there and just dumped some metal desks and file cabinets and we want to get that taken out as part of the remedy for this area. Area F is an area that a long time ago was used as borrow source to cover some of the trash that you saw in 1974 photo.

CAPTAIN ROBERTS: Was used for what? I couldn't hear.

MS. JORDAN: Borrow source, Area F, they had taken some of the soil and put it on top of the area and then later – and I'll point out and discuss as we get further into the discussion – we had an application of sludge and I'll talk about that a little bit later in the presentation.

But those are the areas that we were studying for this landfill. Okay. What we had decided to do, as we were going further into the study and looking at the alternatives for addressing the landfill sites, is to break the sites up into two operable units.

Operable Unit 1 is just those five

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areas. Basically everything you saw in there except for Area E, which is the marsh, the wetland area. That's Operable Unit 1.

Operable Unit 2 is the wetland area that we're still going to do some additional studying on for ecological purposes, but we didn't wan to delay the whole project until we took care of that. So, we found out a way to go ahead and implement the remedy and still continue investigating that portion.

What we're trying to accomplish out here, No. 1, is to protect human health and the environment. We want to make sure we're complying with all state and federal regulations. We want to be cost-effective. We also want to try to use permanent solutions.

We want to prevent or minimize contact with the landfill contents in the surface water and we want a chance to try to enhance the habitat through revegetation. We also want to reduce groundwater from further contaminating the surface water and then some of the wetland that

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will be impacted.

Because we need to cover the landfill area, there are some wetlands in that Area B that was shown up there, we'll need to mitigate for that. So, we'll need to replace and put in wet lands to make up for what is going to be lost during the construction.

I'm going to talk a little bit about use of a presumptive remedy. A presumptive remedy is something that EPA came up with several years ago after EPA started doing oversight for some of these cleanups.

They were going out and cleaning up some of these sites, they looked back over all the data they had of different sites they were working on and different remedies that were tried and they actually established that, Hey, for certain site types, this remedy seems to work very well, seems to be very effective.

It allows people to save time. We don't have to spend a whole lot of time trying to figure out what to do. We already have an

Page 12

established remedy that we can work toward. That way we can get to cleanup faster.

A presumptive remedy for a landfill is containment, which is some type of cover or cap. A cap normally refers to a type of liner material that is placed – if you remember during Site 11, we put a liner out there. That's referred to as a cap. What we're proposing for Sites 1 and 12 is a cover system, which is mainly soil.

We thought it would be a good idea to spend a little bit of time to talk about the risk assessment before we actually start getting into the risk assessment. What is the risk assessment? What a risk assessment attempts to do is to answer the question what if.

We're looking at potential scenarios here. Not what's actually happened, but what could happen. We look at affects on the body, the whole body, or maybe there are only target areas, tissues and organisms that are affected by certain chemicals and we look at total risk associated with this site.

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So, we would look at all the pathways. We would look at groundwater, surface water, sediments and soil. We will total those up. So risk assessment just tries to answer the question what if.

How is the risk evaluated? There are three key components to assessing the risk. One is having your chemicals of concern. The chemicals of concern are determined from your sampling results when you go out and we take soil samples and we get data back from the lab saying these are the chemicals that we found in this soil sample and this is the amounts that we found.

We compare those levels to established levels from EPA and if we are above that level, we retain that chemical. We say that chemical is now a chemical of concern. So, we're going to look at that when we're evaluating and trying to assess the risk at that site.

The next component is a pathway. What is the route of exposure? Where do we find it?

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We find it in the soil and, therefore, people may be coming in contact with the soil. Do we find it in the groundwater?

And then who or what will come in contact with this pathway? Are we looking at sediments in the marsh? And you're going to have habitat in there that are going to be feeding off of that sediment. Those are the three things that we look at during risk assessments. In order for an actual risk to be there, all three of these must be present.

When we look at human health risk we look at human health risk a little bit differently than eco. I'm just going to start with the human health first. Human health effects. We use an established EPA methodology for evaluating the risk.

We have acceptable range levels of risk. From 1 to 10,000 to 1 in a million excess cancer risk and what that means is in addition to anything else in this world that could cause cancer, this is what EPA allows as an excess to

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that. That's what we look at when we're doing a risk assessment.

We're also looking at other health effects, other changes in the body from coming in contact with this specific chemical. If certain chemicals may cause a rash, if you come in contact with it, that's something that would be considered a change in the body.

Those of you who have allergies sometimes pollen will trigger an allergy. That's considered a health effect. You'll start sneezing, runny nose, watery eyes, those are samples of health effects.

What EPA established for health effects is you need to have an index less than one. That means if you have a specific amount of chemical and compared that to an EPA established level, that ratio needs to be less than one and that's a very, very conservative figure that is set by EPA.

They are taking into account the elderly and the very young and people who are very

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sensitive, have very sensitive bodies or reactions. So, they set those levels very, very conservatively.

For the groundwater for Sites 1 and 12, as far as groundwater ingestion for any cancer, we are below EPA's risk range for that. As far as other health effects, there were three chemicals that were identified that show a potential and this is based on a future child or an adult resident.

What this means is they would have to actually drink this groundwater. They'd have to drink – for an adult to drink two liters of this groundwater every day for a period of 20 years. No one is drinking that groundwater today. There are no plans for anyone to drink that groundwater tomorrow, but like I mentioned earlier, we have to look at what if.

What if someone decided to take that water up and drink it? We have to look at that scenario. Also for a site worker we saw some potential for ingestion of groundwater. If

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someone was to drink two liters of it for a period of 25 years.

Soils, surface water and sediment. The soils within the landfill – because we're using a presumptive remedy approach here, the presumptive remedy approach says we're talking about a landfill, you look at the types of material that were placed in the landfill and you just go ahead and presume that if you came in contact with those materials in the landfill, there is a potential risk.

Therefore, you don't go in and spend a lot of time and effort taking samples from the site of the landfill and evaluating them. Use that money to look at the impacts around that landfill.

So, we concentrated on the soil outside the landfill because the presumptive remedy approach says we're going to put in some type of cover, some type of containment system for that.

So, we looked at the soil surrounding the landfill and we found that we were within the

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EPA's acceptable risk for the soils surrounding the landfill sampling of the surface water and sediment. We look at the surface water around the edges of the landfill and the sediments and we were okay there.

Now I'm going to talk a little bit about ecological risk. Ecological risk is approached a little bit differently because there's so many different species. Unlike humans, it's hard to have one particular model that we can evaluate to represent the human population.

We start off sort of in the same way with identifying chemicals of concern, taking samples, comparing them to established EPA levels and if they are greater than that, we then retain them. That's the screening part of the eco risk assessment. There are actually a number of steps.

Once we do the screening, then we have to actually go out on-site and get an idea of what type of habitat is out there and that's when we'll focus our study on the type of habitats and

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organisms that are out there to look at what are the health effects for them.

An example of that would be reproduction rates, if they're failing off, effects of offspring, if their eggshells are thinning or if they're having a shortened life span. This is the type of ecological assessment that we would do.

For Operable Unit 1, which were the five areas I mentioned earlier: A, B, C, D, and F, we did not took at the soils within the landfill because this is a presumptive remedy. We assume those create a potential risk. We don't look at those.

We looked at the surface water and the sediments around there and we found we didn't have any ecological risk. The soil from Area E we did find it exceeded and we started questioning why in this one particular area were we having this exedence of metals? We couldn't figure it out. Why in this particular area?

We started going back through some of

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the historical records and found out that in that one area, Area F, there was a permanent sludge application. Does anyone not know what sludge is?

It came from St. Mary's Wastewater Treatment Plant and sludge was brought on and it was permitted and placed over Area F and that was to enhance vegetation.

Since they had earlier used that as a borrow source at one time to cover up some of the landfill material, they wanted to revegetate that, and sludge is good thing to use to encourage growth.

So once we did that, it no longer became an ecological issue because we're going to use that. We're going to scrape that off and use that for our base when we bring in the cover soil. So, that's going to be buried. So the organisms are not going to be coming in contact with that soil.

Operable Unit 2, which is the wetland area, Area E. We still have to do some

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additional work in there. We did the screening that I mentioned in the eco piece, comparing it to EPA levels. We were above.

We need to now go in there and look at the habitat that we have in that area and look at the impact and effects to them. This is going to take some time to do because we have to go out and put together a work plan to work from and get an idea of what we're going to do, get the biological technical assistance from the EPA to help us with that.

So we know sometime in the future we're going to be ready to announce: This is what we did. This is what we found and this is what the proposed plan is for Operable Unit 2.

Now I'm going to turn this over to Kim Parker and she's going to go through the evaluation and the alternatives. Kim?

MS. PARKER: Thank you, Donna. Good evening. I'm going to talk a little bit about the evaluation of the alternatives and how we came to select what the remedy that we had for

Page 22

this site.

Basically, you see up here we have the national – we used the National Contingency Plan or NCP, which is used as an overall federal guidance in evaluating sites for environmental sites and installation restoration sites in selecting an alternative.

EPA has approved the National Contingency Plan, and the NCP basically goes to outlining the evaluation process. It's based on nine criteria. The criteria is shown in your proposed plan. One is a threshold criteria, which is based on two factors as you see mentioned here, two sources of criteria.

One is the overall protection of human health and the environment. Basically, human health and the eco portion of it and then the compliance with your ARARs that's mentioned and that's shown in your proposed plan and that's what we – that's basically a technical portion of what's evaluated in selecting a remedy.

Also, what we consider is the primary

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balancing criteria, which has five different factors associated with that.

Table 2, which is shown in your proposed plan, outlines that and it shows the long-term effectiveness, the reduction in toxicity, implementability and you look at your short-term effectiveness and also considers your cost.

Basically, the primary balancing criteria and the threshold criteria are the technical factors that we considered. We also look at the – or consider modifying criteria, which is where we talk with the state and we partner with the state and make sure the state provides their buy in to what we're doing so they will – we have to actually get state acceptance and community acceptance, which is basically what we're doing here.

We're giving you-all the opportunity to comment on the proposed plan and also we – as you know, we have a 30-day response period – public response period, which we also consider in evaluating the remedy.

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So, we're not going to just be actually looking at technical factors solely. We're also going to consider what the public considers to actually be an issue with the site and the state will also take a look at that to see if that will be a factor in determining the appropriate remedy for the site.

Now, the alternatives that we evaluated in the – actually, let me back up to the feasibility study, which if you-all haven't seen a copy of it, we have a copy actually here.

The feasibility study is basically done before the proposed plan. It's done after the remedial investigation where we actually list our alternatives that were selected. We had five that were initially listed, but two of those alternatives were in reference to the marsh or the wetlands.

So, we – since we actually decided, as Donna mentioned earlier, to put that as part of OU-2, we decided not to consider them as alternatives and that basically gave us three

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alternatives to actually consider. So that's what you see listed here.

We have Alternative 1, which is no action, not doing anything at all. Then we have Alternative 2, which would be installing a vegetative soil cover, which would be a cover over Areas B and D, as Donna had mentioned before you saw where Areas B and D were.

Then we would be excavating debris from Area C and actually disposing of it off-site. We'd be actually installing institutional controls and having long-term monitoring.

The third alternative would be almost the same as Alternative 3, except we would actually have a RCRA Subtitle D cap, which is basically a liner, which is included in the – in the landfill along with the soil cap.

And that would also be – it would actually do the same thing with the excavation of the contaminated material and disposing of it off-site and still have institutional controls and long-term monitoring.

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You also see that we included the cost between the two and there is a substantial difference and that was mainly because of the liner that's associated with Alternative 3.

That liner is a like a geosynthetic type liner and you normally have to get a specialty contractor to come in to install that. So, it does increase the cost as you see here.

Now, the preferred alternative which was selected was Alternative 2. Alternative 2, as I mentioned earlier, was a soil cover, vegetative soil cover, which involves 6 inches of top soil and 18 inches of subsoil, which gives you a total of 2 feet, has 2 percent slope's and we're going to be reviewing it over a five-year period. This is consistent also with the presumptive remedy which EPA has asked us or has mandated that we comply with.

So, that's what this – this is the alternative that we selected. The main reason that it was selected is because Alternative 2 and 3 both meet human health and ecological risks and

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we felt that this alternative would still be able to allow us to reduce that risk and then also it would be the most effective remedy in this case.

The only situation with Alternative 2 is that we would have to request a variance from the State of Maryland because of their landfill closure requirements. They have a landfill closure requirement for a synthetic liner.

We've been partnering, talking with the State of Maryland and they don't see a problem with giving us this variance, but the main reason that they don't see a problem and the reason that we feel this it's beneficial to get the variance is for – based on four different factors.

One is the – as you see listed here, the wastes are in contact with the groundwater and really what that means is either way, either alternative, Alternative 2 or 3, the wastes are going to be in contact with the groundwater.

We're still – the infiltration of groundwater is not an issue here and that's based on the water level, which is controlled by the

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water table at the Pax River, the Pax River being right there close to it. That's what controls the water levels. It's not the infiltration of the surface water.

So, if you had a liner, there wouldn't really be a benefit either in having a liner or not having a liner. You're still going to have the waste being in contact with the groundwater. So, there wasn't a real benefit in having a liner.

The second factor here, a liner would not significantly reduce surface water infiltration versus a soil cover and we did some modeling there to look at the differences between having a liner and not having a liner.

Having a liner and actually having one and – having a liner the reduction might be about 36 percent. Without having one, with having a soil cover, it would be about 15 to 20 percent. So, there wasn't a significant difference in actually having a liner in the cap.

Another factor is that St. Mary's County

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prohibits installation of shallow drinking water wells and that's a requirement. That's basically because they don't feel that the drinking water levels – they don't allow you to install the water wells.

They don't think that that would actually be an issue where infiltration would come into play. We don't – that would not – because they're not allowing us to do that, that would not be an issue that would be – that would have to be considered with installing a liner.

The Class III aquifer. A Class III aquifer, I don't know if you-all know, that's basically an aquifer that has a high salinity value or high salt content and we have a shallow aquifer that's actually in between the landfill and the river – the Patuxent River.

So, if we did try to actually come in and install a well in between the landfill and the river, it wouldn't give us any benefit in trying to determine what the levels of contamination were there because you'd be getting

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high salinity levels.

I wanted to – Linnea Eng, who's our contractor on the project – our consultant. She's with CH2M Hill. She has a diagram here and I'll let her come up and just talk a little bit about the groundwater and the aquifer.

MS. ENG: Hi everybody. I just wanted to give a little bit more information on what we're talking about as far as the water that we evaluate for the risk assessment, the water where we did find contamination, what's happening with that groundwater in the flow system, and why that would be classified as a Class III or brackish water source.

The general flow system that we're looking at here is we've got a landfill that's in the surface and getting into the water table. Overall, we have a recharge area where you have surface water infiltration and that water is flowing down from the land source and going into this.

This is a figure from a textbook. So,

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it's talking about a stream, but you have a pretty big stream out there. The Patuxent River is a major water body that receives quite a bit of groundwater. You have groundwater that not only flows directly horizontally towards the river, but there's actually upward flow into the river and you see a little bit of that coming up here.

That water that's deep below the bottom of the river is actually still flowing into the river. And then the other thing that I wanted to mention is that there's a major confining unit.

The St. Mary's formation is a major, very thick – I believe it's 200 to 250 feet – confining unit and the drinking water that you-all have as a source in St. Mary's County comes from aquifers that are below that confining unit. That confining unit prevents significant flow – groundwater flow downwards toward that other aquifer that you get your drinking water from.

ATTENDEE: So, are the contaminants that

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are contained within this, they're going into the Patuxent?

MS. ENG: Yes.

ATTENDEE: Because it's so diluted by the salt water that it's going into, it's not a health risk for the organisms out there then?

MS. ENG: Right. Right. We did take samples of the water in the river to make sure that we weren't seeing any contaminant levels, but also we looked at the levels in the groundwater here.

It's really – they're not that high. We're talking about levels is in terms of the levels is in the parts per billion range, which if you think about this in and of itself, it's pretty low concentration.

But then, when you talk about tens of thousands of gallons of water going into the river versus – I think it 's on the order of a million gallons per day that's flowing by –

ATTENDEE: How deep is the confined – where is the confining bed upper height? How

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deep is that?
MS. ENG: We did not – not all of our wells have reached the confining unit. So, I can't actually tell you the exact depth in all areas, but I believe it's about 100 feet deep. We actually have wells that go – that went into the St. Mary's formation.
The upper part of that formation is fairly permeable. It's not as permeable as what's right up close to the surface, but it is more permeable. We considered that there is a continuous confining unit high up there, but down below about 100 feet there's the St. Mary's formation that is present throughout this area.
CAPTAIN ROBERTS: I have a question. If I understand the way we – that the aquifers for the water supply for St. Mary's County it's below this confining level because these are considered unreliable sources of potable water because you have surface water that infiltrates, you have the Chesapeake Bay that will put salines – saltwater content into it, et cetera,

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you know, fertilizer off of your lawn could get into this shallower amount of water. That's why that's not used, is that correct?
MS. ENG: That's correct, yes.
CAPTAIN ROBERTS: Okay.
MS. ENG: In most parts of the country nobody wants to put a drinking water well into a shallow unconfined aquifer for those very reasons. In this particular area, if we look at the other slide, if you did put a well in, you would actually draw water back.
If you put a production well in that's actually going to produce any significant amount of water, you would actually draw water back from the river into the well.
We're talking here about wells that are in that strip of land between the landfill and the river downgradient and once you start drawing that water in, as you know I'm sure, the river is pretty brackish. You start drawing water back from the river, you get brackish water and nobody is really going to want to drink that.

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So, again that risk assessment, that's some pretty conservative scenarios that were looked at as far as putting a residential well in this area. Nobody is going want to drink the water from that well for 25 years. It's going to taste pretty bad.
CAPTAIN ROBERTS: So, we looked at this just as a what if. Is that correct?
MS. ENG: Yes.
CAPTAIN ROBERTS: But nobody – you're not allowed to put a well there and if you did, it was going to be saline to where you couldn't use it for anything, is that correct?
MS. ENG: That's right.
CAPTAIN ROBERTS: Okay.
ATTENDEE: Why does it only flow to the right?
MS. ENG: It only flows to the right?
ATTENDEE: Maybe it's only flowing to the right. Why doesn't it flow to the left?
MS. ENG: I'm trying to think of the best way explain this but what we look at is –

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it's the water level head in any area. The water is continuous. If you can think of a – actually the water in a swimming pool. If you tipped – I don't know if there is a good way to explain it. If you tipped the edge of the swimming pool up, your water is going to flow towards the lower area.
ATTENDEE: But maybe the other drawing was better because this shows a well being sunk.
MS. JORDAN: That's a production well
ATTENDEE: I think I understand, what you're saying and what I'm saying is it seems like it implies the what's off the picture is higher. If it's all based on height, but the land is causing it to move from left to right.
The reason I ask the question is – another way of asking the question is how much area is being affected on the back side or left of the rudder, north and south of what we're seeing? How far is that? Because I understand the Amish drink from that.
MS. ENG: You're talking about the local

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flow system right here and there's – when you talk about groundwater flow, you can talk about local and regional groundwater flow and this is a local flow system in your shallow aquifer.

It does, to a certain extent, follow the topography and that has to do with the way that the surface water infiltrates in different areas and where the confining units tend to be with respect to the topography, but the shallow aquifers we're talking about here really is local. If you looked even someplace else on the base, you might find – in fact you would find –

ATTENDEE: Local –

MS. ENG: – that the flow might be towards some other water.

ATTENDEE: Does local mean that it's confined to the base in that direction? Just for curiosity because, see, I don't know what you're saying. If you say confined to the base, I could accept that as known. If that's not known, then I would have a question because there are people drinking from that, as I understand it.

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MS. ENG: I'm not sure if I know what you mean by – what you're asking.

ATTENDEE: You're looking at this from the air, from an airplane and you can see that it's flowing that way, but there's probably something going on that we're not seeing on the other side all the way around and I'm asking how far that extends.

See, if that doesn't extend off the base and, you know that, then, it's a nonissue for the community. But if it does extend off the base into the groundwater, there are people that are drinking that.

MS ENG: No, the closest thing we are talking about any contaminated water that's coming from the area of this landfill is discharging immediately into the river and if we could look at the – he's going to show us –

ATTENDEE: It doesn't contaminate the direction of the perimeter of the base?

MS. ENG: It absolutely does not.

ATTENDEE: That's the question I'm

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asking.

MS ENG: That's correct. There are other areas of the base that flow may not be toward the river, but in this area, it is flowing through.

ATTENDEE: All right.

CAPTAIN ROBERTS: If you look at the geography of that area, the road and everything is up very high and this is a very significant slope that comes down from the road right down on to the point and it all comes down right on to that point.

So, I think what we're trying to say is that geography in that particular area, when we talked about it before was when we say local, this is in the area of Fishing Point and there was another chart at one time that I had looked at –

MS. PARKER: Unfortunately, we didn't bring that one, the overflow of the base.

CAPTAIN ROBERTS: That kind of showed the geography and water flow from the top, which

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is what he's talking about.

MS. JORDAN: I have a copy of the remedial investigation. I can show you where that is.

ATTENDEE: Just for curiosity.

CAPTAIN ROBERTS: We can answer that.

MS. PARKER: Can you go back to the slide that was just up there? The last slide before Linnea Eng came up. Just one highlight that I thought should definitely be mentioned here. The last thing is what we're doing with this site, which I think is a highlight.

It's basically a highlight for the base and for the citizens of the community, is the recreational reuse that we plan on doing with this site. By using this alternative, we're going to be able to provide back to this area what was there before: The fishing, the hunting, the environmental trials that we had in there.

I think that's the main benefit of this whole remedy that we have. By having the vegetative soil cover, we're going to – you're

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going to be able to have the beneficial use of this site back again once we get the remedial action actually into place, once we start actually getting this going.

So, I think that is key and I think it's the highlight of this whole thing, actually to be able to come back full circle and get back to where – I mean, that's basically what the – what environmental remediation is all about.

You're supposed to be able to provide a level of life that you were initially used to, to be able to get that back again. So, I think that's what the benefit of this whole thing is to be able to – once we complete this project, you'll be able to see what was there before.

The only thing I wanted to mention, if we did actually have the alternative where we had the actual liner and the cap, there might be some restrictions or some slight restrictions that might be involved as far as maybe hunting. You'd have to be kind of careful with the cap.

The cap has a lot of different factors

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that have to be considered and different options that would have to definitely be considered. So, that's why we think that Alternative 2 would be the best way to actually go here.

And then we have the schedule. You-all probably want to know how soon we can be doing all this work, get everything going. As you know right now, we're in the middle of public comment period. It started November 1st and goes to the end of this month, the 30th.The public meeting is tonight, November 9th.

Our plan is to award the remedial action contract on December 14th, if we don't have any substantial comments that have to be addressed. We plan also to have the Record of Decision signed hopefully on February 14.

The Record of Decision basically outlines what the alternative was and it provides a signature by both the Navy and by EPA where we both agree on the remedy that's going to – that has been selected and we agree on what we're going to actually be doing to get this site

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remediated.

ATTENDEE: Can I ask a question about Alternative 2?

MS. PARKER: Okay.

ATTENDEE: The question I'm not clear on – I did try to read this before I came here. I have very short exposure to this. On Alternative 2, I think what you said or what this says is that there would be some soil removed. Right?

MS. JORDAN: There's going to be some debris removed from Area C.

MS. PARKER: Just area C.

ATTENDEE: What is defined debris? Is that contaminated?

MS. PARKER: Yes.

ATTENDEE: So, that is contaminated soil, which would be the major concern?

MS. PARKER: Right. And that will be disposed of only in area C.

ATTENDEE: Okay. But if you do Alternative 3, that would not be done, but the

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bottom would be lined. Is that what I understand?

MS. JORDAN: We still have to do some removal from Area C even if we put on the liner.

MS. PARKER: Yes. The only difference there with Alternative 3 is just putting a liner. We'd be doing the same excavation from Area C, from the same area.

ATTENDEE: Some material will be being returned in 3 to the surface, right?

MS. PARKER: Yes.

ATTENDEE: But you will dispose of all of the site contaminated soil there?

MS. PARKER: That's contaminated soil that we're going to actually remove.

ATTENDEE: You think with the liner you wouldn't have to remove it? You would just keep it here, but move it to below the liner?

MS. PARKER: Well, actually –

ATTENDEE: Well, the liner goes down to the bottom and the cap goes on the top, right?

MS. PARKER: The liner goes over – goes

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over top of the trash.
ATTENDEE: So, there's nothing on the bottom?
MS. PARKER: No, the liner is just basically underneath the vegetative soil cover. So, it's – we're going to have the liner. So it's –
ATTENDEE: How does the liner differ from the cap?
MS. PARKER: Well, a liner is geosynthetic type fabric. So, it's like membranes –
ATTENDEE: And the cap is just dirt?
MS. PARKER: That is the cap.
MS. JORDAN: The cover is what you call the soil. The cap would be the liner.
ATTENDEE: So, the liner and the cap are the same?
MS. PARKER: Pretty much, except you're getting more cover with that.
MR. UNDERWOOD: Just a clarification. The Area C cap or cover would be very similar to

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the Type II cover except it's got a membrane in it and an impervious layer and that membrane is the impervious layer. It would minimize infiltration. The remainder of it, other than maybe a little bit in thickness is essentially still the cap, but it has the membrane. So, the difference between them is the – you have a membrane in the cap system.
ATTENDEE: That's 500-year lasting.? How long is that supposed to last if not penetrated by trees or roots?
MR. UNDERWOOD: Fifty to 100 years is what they generally are saying now for these types of materials in cover of the soil.
MS. PARKER: Randy is also with CH2M Hill and he actually designed the site.
ATTENDEE: You guys talked about before that there's no significant amount of subsoil infiltration. So, what would be the point of having the more expensive liner when supposedly there's not all that surface water infiltration when all the water is supposedly coming from the

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water levels generated by the Patuxent?
MS. PARKER: Well, that's what we're saying. We don't – that's why we're not – that's why they don't want to go with the liner. We're basically saying that we don't see a real benefit by using that liner because the control is not the infiltration. The control is the water level, which is dictated by Pax River. It's not by the infiltration. That's not what's driving everything.
So, it kind of seems like you're paying the cost, you're paying an extra $4 million and it doesn't seem like you're actually getting that much benefit by having a liner. That was when the assessment was –
ATTENDEE: How deep is the smallest stuff actually buried in the water? Was the stuff fully submerged or partially submerged or –
MS. PARKER: The trash that was actually there? Part of it was actually submerged, wasn't it?

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MS. JORDAN: Actually, in the wetland a lot of the area was a prior wetland, which was just filled in. It was just common practice back then to just put trash in the wetland. We weren't breaking any law back then. We were just doing it. The property belonged to us and we had to get rid of it.
MS. PARKER: Right. A lot of environmental laws weren't in place then. So the Navy didn't know that there was going to be – that it was in violation of environmental laws. Actually, all this basically came into play around '83. So they didn't have to comply previously.
ATTENDEE: Speaking of the wetland issue, have you identified the site yet for the mitigated wetland that you're going to reconstruct for those you're destroying?
MS. PARKER: Actually, no, we haven't. We have a few sites that we are looking at, but we haven't – we haven't actually decided – we haven't selected a site. That's what – that's

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what the following one will be with OU-2, which will be actually trying to select a site and see where we're going to actually replace those wetlands.

CAPTAIN ROBERTS: A little more in-depth on that. Our in natural resources people have done several studies, looked at where they would like to put wetlands or if we're ever in a situation where we had to replace in like wetland, they already have several areas that they've studied and looked at where they would want to do it.

The only thing left in this part is which one do we select? He's got several of them that he would like to put in wetlands there, but we haven't selected the one yet.

MS. JORDAN: We did look at trying to put the wetlands back on-site, but the topography wasn't going to work out with us that we were going to have to recharge and keep it pliable. So, then we began looking at places off-site.

ATTENDEE: It would still be on base

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though?

MS. JORDAN: It would still be on base, just away from the site.

MS. PARKER: That will be the next follow-on to this. We will be actually addressing that. So, see, we don't really have a limited – there's not a defined time frame of when we actually have to do that.

ATTENDEE: You don't have a time reference for the Unit 2 then?

MS. PARKER: No, not at this time. We're going study it further and see.

ATTENDEE: Well, the wetlands is not a subject of discussion today, right?

ATTENDEE: There's some on Unit 1 also.

MS. JORDAN: They are going to be impacted by the covering up.

ATTENDEE: Because see, I'm always leery when humans say they know more than Mother Nature and just sprinkle wetlands wherever they want. It took 3.6 billion years to settle where they are and we're going to move them in a matter of

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seconds and the only thing I see as the saving grace of this is that you're going to check every five years to see if Mother Nature didn't reject your wetlands, at which point I'm not sure we know enough to do that yet. But we'll discuss that I think in context later.

MS. JORDAN: Well, the natural resources – Kyle is here – but they already have areas in here. Some are already wetlands to look at, can we enhance these areas and make them more in that recovering of the landfill site?

ATTENDEE: Well , I can see enhance. That's not making new.

MS. JORDAN: We are going to have to create some new ones.

MS. ENG: The wetlands we are talking about is primarily different types of reeds that sprung up on top of the landfill itself. So, we're not talking about billions of years. We're talking about 30 years of growth on top in sort of low spots on top.

ATTENDEE: Okay.

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MS. PARKER: And one thing that you maybe mentioned when you were talking about monitoring for the landfill – I mean for the actual wetlands – that we are going to be doing continuous long-term monitoring. So, that we will – if we get significant increases in any of the contaminants, we definitely will take another look and see what needs to be done. So, that will be consistently done over five-year periods.

ATTENDEE: Are there any wells in that area except for test wells? Are there any operational wells there?

MS. JORDAN: No.

CAPTAIN ROBERTS: No.

ATTENDEE: I didn't think there would be. It wouldn't make sense, but you never know.

MS. PARKER: That pretty much concludes the presentation. I just wanted to mention that all this information is available at these two different libraries or repositories where you can get a copy of the remedial investigation report and feasibility study report and the proposed

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plan. We have all that available.

I Also just wanted to let you know that you can send any comments that you have based on the proposed plan and this presentation tonight to Ms. Joan Hinson, who is here this evening. She's from the commanding officer's group and our environmental support group. This is the address here. So you can –

ATTENDEE: Does she have an e-mail address?

MS. PARKER: Yes. That's listed in the proposed plan. She was gracious to help set up all the audiovisual and the actual getting the sound effects here. We appreciate that. But that's pretty much it for the evening. If there's any more questions, we can address them now or after. Captain?

CAPTAIN ROBERTS: Well, I think you can see that it does really meet the requirements of what we want to do to clean that up, to protect it and to protect the human and ecological receptors and to do what we should do to make

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that land accessible. Right now it's not.

It's probably the most cost-effective and I think the cover probably meets all the requirements. In fact, I'm sure it does. But the other thing that's really going to allow us to do is really reuse that property for recreation.

We've started on a plan and we've been talking about looking at what we can use that for. First shot was a little conservative. We're going to take another shot. But I want to have a full spectrum of recreational facilities down there.

One of the things we also want to do is to – you know, there's some great fishing there, good access to the area, there's fishing right off the point there, hopefully camping and picnicking. And then there's a real nice white beach that's built up there now.

Also, we're going to put walkways across to protect the grass that we put in there, to save that, which we need to do after all that.

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So you know the build up there. It's a beautiful spot right now.

We get this cleaned up, recontoured so that we can have that 2 percent for the surface water and I think it's going to – we are going revegetate it. It's going to have the potential to be a really beautiful place that the people can enjoy and use.

So, we're doing what we have to do to clean it up. We're going to reuse it and I think it's one of the better reuse projects in the Navy right now. I mean, I already show this as reuse in what we've done with the beach and this is really going to be a great project.

I'm really looking forward to it, to take the piece of property that wasn't used in the way it was in the past and turn it into something that's cleaned up and reusable and is esthetically pleasing.

This is why I've been so excited about this project for so many years since I've been here is because of the potential for the reuse

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and it really is a beautiful site and it ought to be shared with everybody when we get it open.

Does anybody have any questions of me at all?

ATTENDEE: Are you going to go fishing there?

CAPTAIN ROBERTS: Yes. Actually, I snuck down there once already. I have the keys.

ATTENDEE: One quick question, do you have the $4 million?

MS. JORDAN: Yes.

CAPTAIN ROBERTS: Yes, we do. It's been budgeted. This process is always interesting. This is a long-term process in assessing the studies in which you have and the right alternatives and checking and working on these processes takes a long time.

In fact, it's kind of difficult to guess what fiscal year to budget the project in because it takes so many years to get it through the process. So, it is budgeted and we're looking forward to starting – being able to start up on

the project in the spring. I think the major cover area, moving the land and contouring and everything is about a ten-month issue isn't it?

MS. JORDAN: Right. That's why we're going to try to get out there in the spring and get it done in one season.

CAPTAIN ROBERTS: Okay. Well, thank you very much for being here. I appreciate your questions and comments. I'm pleased that you were here.

(Whereupon, the public meeting was concluded.)

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Lawyer’s Notes

Appendix C
Estimated Noncarcinogenic Risk Tables (Groundwater)

Table C-1
Estimated Noncarcinogenic Risk
Groundwater Ingestion
Future Child and Adult Resident Scenario
NAS Patuxent River Fishing Point Landfill (Sites 1 and 12)

Chemical	Oral Reference Dose (RfD) (mg/kg-day)	Exposure Point Concentration (Fg/l)	Child			Adult			Percent of Total Risk
			Estimated Daily Intake (DI) (mg/kg-day)	Hazard Quotient (DI/RfD)	HQ>1?	Estimated Daily Intake (DI) (mg/kg-day)	Hazard Quotient (DI/RfD)	HQ>1?	
Volatiles									
1,2-Dichloroethane	3.0E-02	6.0E-01	3.8E-05	1.3E-03	NO	1.6E-05	5.5E-04	NO	0.02%
Inorganics									
Antimony	4.0E-04	7.7E-+00	4.9E-04	1.2E+00	**YES**	2.1E-04	5.3E-01	NO	15.24%
Barium	7.0E-02	3.1E+02	2.0E-02	2.8E-01	NO	8.4E-03	1.2E-01	NO	3.47%
Cadmium	5.0E-04	1.4E+01	8.9E-04	1.8E+00	**YES**	3.8E-04	7.7E-01	NO	22.17%
Chromium	5.0E-03	1.0E+01	6.4E-04	1.3E-01	NO	2.7E-04	5.5E-02	NO	1.58%
Manganese	2.4E-02	1.6E+03	1.0E-01	4.3E+00	**YES**	4.4E-02	1.8E+00	**YES**	53.12%
Nickel	2.0E-02	1.1E+02	7.1E-03	3.5E-01	NO	3.0E-03	1.5E-01	NO	4.39%
HAZARD INDEX (Sum of DI/RfD)				**8.1E+00**			**3.5E+00**		100%

Calculation:

$$\text{Daily Intake (mg/kg-day)} = \frac{\text{Conc} * \text{IngR} * \text{EF} * \text{ED}}{\text{BW} * \text{AT} * 365\ \text{days/year} * 1000\ \text{Fg/mg}}$$

EXPOSURE ASSUMPTIONS		
Exposure Setting	**Future Residential**	
Exposure Case	Child	Adult
IngR - Ingestion Rate (liters/day)	1	2
BW - Body Weight (kilograms)	15	70
EF - Exposure Frequency (days/year)	350	350
ED - Exposure Duration (years)	6	24
AT - Averaging Time (years)	6	24

Table C-2
Estimated Noncarcinogenic Risk
Groundwater Ingestion
Current and Future Site Worker Scenarios
NAS Patuxent River Fishing Point Landfill (Sites 1 and 12)

Chemical	Oral Reference Dose (RfD) (mg/kg-day)	Exposure Point Concentration (Fg/l)	Estimated Daily Intake (DI) (mg/kg-day)	Hazard Quotient (DI/RfD)	HQ>1?	Percent Of Total Risk
Volatiles						
1,2-Dichloroethene	3.0E-02	6.0E-01	1.2E-05	3.9E-04	NO	0.02%
Inorganics						
Antimony	4.0E-04	7.7E+00	1.5E-04	3.8E-01	NO	15.24%
Barium	7.0E-02	3.1E+01	6.0E-03	8.6E-02	NO	3.47%
Cadmium	5.0E-04	1.4E+01	2.7E-04	5.5E-01	NO	22.17%
Chromium	5.0E-03	1.0E+01	2.0E-04	3.9E-02	NO	1.58%
Manganese	2.4E-02	1.6E+03	3.2E-02	1.3E+00	**YES**	53.12%
Nickel	2.0E-02	1.1E+02	2.2E-03	1.1E-01	NO	4.39%
Thallium	8.0E-05	2.0E+00	3.9E-05	4.9E-01	NO	19.85%
HAZARD INDEX (sum of DI/RfD)				**2.5E+00**		**100%**

Calculation:

$$\text{Daily Intake (mg/kg-day)} = \frac{\text{Conc} * \text{IngR} * \text{EF} * \text{ED}}{\text{BW} * \text{AT} * 365\ \text{days/year} * 1000\ \text{Fg/mg}}$$

EXPOSURE ASSUMPTIONS	
Exposure Setting	**Current and Future Scenarios**
Exposure Case	Site Worker
IngR - Ingestion Rate (liters/day)	2
BW - Body Weight (kilograms)	70
EF - Exposure Frequency (days/year)	250
ED - Exposure Duration (years)	25
AT - Averaging Time (years)	25

Appendix D
Table of ARARs

Table D-1
Federal Location-Specific ARARs
Record of Decision for Sites I and 12, Patuxent River Naval Air Station

Location	Requirement	Prerequisite for ARAR to apply	Citation	ARAR Determination	Comments
National Archaeological and Historical Preservation Act					
Within area where action may cause irreprable harm, loss, or destruction of significant artifacts	Construction on previously undisturbed land would require an archaeological survey of the area.	Alteration of terrain that threatens significant scientific, prehistoric historic, or archaeological data.	Substantive requirements of 36 CFR 65; 16 USC 469	Relevant and Appropriate	Although construction at Site 1 or Site 12 will not occur on previously undisturbed land, the requirements of this regulation are relevant and appropriate for response action that can impact the archaeological site adjacent to Site 1.
Historic Sites, Buildings, and Antiquities Act					
Historic sites	Avoid undesirable impacts on landmarks	Areas designated as historic sites.	16 USC 461; 40 CFR 6.301	Relevant and Appropriate	Although none of the historical structures on the Patuxent River NAS are of undisturbed land, the requirements of this regulation are relevant and appropriate in situations where remedial actions may adversely affect the historical structures located on the NAS.
Endangered Species Act of 1973					
Critical habitat upon which endangered species or threatened species depend	Requirement to conserve endangered species or threatened species, including consultation with the Department of the Interior. Reasonable migration and enhancement measures must be taken, including live propagation, transplantation and habitat acquisition and improvement	Determination of effect upon endangered or threatened species or its habitat by conducting biological assessments.	16 USC 1531; 16 USC 1536(a)	Applicable	There is a federally threatened animal species (Northeastern Tiger Beetle) in the vicinity of Sites 1 and 12. If remediation activities could impact this species consultation with the Department of the Interior is required to determine the appropriate action.
Migratory Bird Treaty Act of 1972					
Migratory bird area	Protects almost all species of native birds in the U.S. from unregulated taking which can include poisoning at hazardous waste sites	Presence of migratory birds.	16 USC Section 703	Applicable	Migratory birds are encountered at Site 1 and Site 12. These requirements are applicable to any response actions that could results in unregulated “taking” of native birds
Marine Mammal Protection Act					
Marine mammal area	Protects any marine mammal in the U.S. except as provided by international treaties from unregulated taking	Presence of marine mammals.	16 USC 1372(2)	Applicable	Marine mammals are present in the Patuxent River. Erosion and sediment control and stormwater management measures will be taken to protect marine mammals. Response actions will not involve unregulated “taking”.
Fish and Wildlife Coordination Act, Fish and Wildlife Improvement Act of 1978, Fish and Wildlife Conservation Act of 1980					
Area affecting stream or other water body	Provides protection for actions that would affect streams, wetlands, other water bodies or protected habitats. Any action taken should protect fish or wildlife	Diversion, channeling or other activity that modifies a stream or other water body and affects fish or wildlife.	16 USC 661; 16 USC 662; 16 USC 742a; 16 USC 2901; 50 CFR 83	Applicable	Response actions, such as shoreline stabilization and soil cover installation will incorporate protection for any area water body, wetlands, or protected habitats.
Procedures for Implementing the Requirements of the Council on Environmental Quality on the National Environmental Policy Act and Executive Order 11990, Protection of Wetlands					
Wetland	Requirement to minimize the destruction, loss, of degradation of wetlands. Wetlands of primary ecological significance must not be altered so that ecological systems in the wetlands are unreasonably disturbed	Wetlands as defined by Executive Order 11990 Section 7.	40 CFR 6, Appendix A excluding Sections 6(a)(2), 6(a)(4), 6(a)(6), 40 CFR 6.302	Applicable	Wetlands are present in the vicinity of Site 1 and Site 12. Remedial activities such as soil cover installation, must minimize the destruction, loss of degradation of the wetlands
Clean Water Act, Section 404					
Wetland	Dredged or fill material must not be discharged to navigable waters if the activity; contributes to the violation of Maryland water quality standards; jeopardizes endangered or threatened species; or violates requirements of the Title III of the Marine Protection, Research and Sanctuaries Act of 1972.	Wetland as defined by Executive Order 11990 Section 7.	40 CFR 230.10; 40 CFR 230.41; 40 CFR 230.70-230.77; 40 CFR 230.60-230.61	Applicable	Wetlands and navigable waters (Patuxent River) are present in the vicinity of Site 1 and Site 12. Remedial activities, such as soil cover installation will comply with the requirements of these regulations
Wild and Scenic Rivers Act					
Within area affecting national wild, scenic, or recreational rivers	Avoid taking or assisting in action that will have direct adverse effect on national, wild or scenic recreational rivers	Activities that affect or may affect any of the rivers specified in Section 1274 and 1276(a)	16 USC 1271-1276; 36 CFR 297; 40 CR 6 302 (e)	Relevant and Appropriate	The Patuxent River is not a national wild, scenic, or recreational river. 1 is a State designated scenic river, however. The requirements of this regulation are relevant and appropriate to the shoreline stabilization activities at Site 1 and Site 12

Table D-1
Federal Location-Specific ARARs
Record of Decision for Sites I and 12, Patuxent River Naval Air Station

Location	Requirement	Prerequisite for ARAR to apply	Citation	ARAR Determination	Comments
Magnuson Fishery Conservation and Management Act					
Managed Fisheries	Provided for conservation and management of specified fisheries within specified fishery conservation zones (in federal waters)	Presence of managed fisheries in federal waters.	16 USC 1801	Relevant and Appropriate	The Patuxent River is a fishery (occurrence of harvesting, and recreational and commercial fishing). The Patuxent River is under State jurisdiction, however. The requirements of this regulation are relevant and appropriate for installation of the soil cover (e.g. erosion and sediment control and stormwater management).
Resource Conservation and Recovery Act (RWCA)					
Within 100-year floodplain	Facility must be designed, constructed, operated, and maintained to aviod washout	RCRA hazardous waste; treatment, storage, or disposal of hazardous waste	40 CR 264.18 (b)	Relevant and appropriate	Portions of Sites 1 and Site 12 are located in a 100-year floodplain. Therefore the requirements of this regulation are relevant and appropriate to installation of the soil cover over the landfill. In addition, wetlands that are destroyed will be mitigated
Executive Order No. 11988, Protection of Floodplains					
Within floodplain	Actions taken should avoid adverse effects minimize potential harm, restore and preserve natural and beneficial values, including wetlands.	Action that will occur in a floodplain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood-prone areas.	40 CFR 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Relevant and Appropriate	Portions of Sites 1 and Site 12 are located in a 100-year floodplain. Therefore the requirements of this regulation are relevant and appropriate to installation of the soil cover over the landfill. In addition, wetlands that are destroyed will be mitigated
Executive Order No. 60 FI FR No. 154, 8/10/95					
Enviromentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds	Establishes guidelines to assist federal agencies in the implementation of enviromentally and economically beneficial landscape practices	Landscaping on federal grounds	60 FR No. 154	To-be-considered	Native drought-tolerant species will be used to cover the landfills in furtherance of Executive Order No. 60 FR No. 154

Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes are policies does not indicate that DON accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading only substantive requirements of the specific citations are considered potential ARARs.

ARARs - Applicable or relevant and appropriate requirements
RCRA - Resource Conservation and Recovery Act
CFR - Code of Federal Regulations
CWA - Clean Water Act
DON - Department of the Navy
EO - Executive Order
FR - Federal Register
HWCA - Hazardous Waste Control Act
NAS - Naval Air Station
USC - United States Code
TBC - To Be Considered

Table D-2
Federal Location-Specific ARARs
Record of Decision for Sites I and 12, Patuxent River Naval Air Station

Location	Requirement	Prerequisite for ARAR to apply	Citation	ARAR Determination	Comments
Threatened and Endangered Species					
Critical habitat upon which endangered species or threatened species depend	Requires action to conserve endangered or threatened species and the critical habitats they depend on. May not reduce the likelihood of either the survival or recovery of a listed species in the wild by reducing the reproduction, numbers or distribution of a listed species of otherwise adversely affect the species.	Determination of effect upon endangered or threatened species or its habitat	COMAR 08.03.08	Applicable	There is one state-designated endangered plant species. (Fall Witchgrass) that has been identified in the landfill footprint, as well as other areas of the NAS. These regulations are applicable to the installation of the soil cover, which may jeopardize this plant species
Threatened and Endangered Fish Species					
Critical habitat upon which endangered or threatened fish species depend	Requires action to conserve endangered or threatened fish species and the critical habitats they depend on.	Determination of effect upon endangered or threatened fish species or its habitat	COMAR 08.02.12	Applicable	The endangered and threatened fish species identified at the station are situated in the open bay. These regulations are applicable if remedial actions, such as installation of the soil cover, jeopardizes endangered or threatened fish species.
Nontidal Wetlands Protection Act, Maryland Nontidal Wetlands Regulations					
Wetland	Provides regulations for activities on or near nontidal wetlands (an area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions). Regulations include avoiding wetlands degradation occur as a result of permitted human activity, these loses or degradations should be offset wherever practicable and feasible	Activities that will occur on or near nontidal wetlands	COMAR 05.09.5-902	Applicable	Nontidal wetlands are present in the vicinity of Site 1 and Site 12. The substantive requirements of these regulations must be met for installation of the soil cover over the wetlands
Wetlands and Riparian Rights					
Wetlands	Requirements to preserve wetlands and prevent their destruction; requires a license for dredging or filling of wetlands	Activities that affect the integrity of wetlands, such as dredging or filling	COMAR 16.02. 16.-202	Applicable	Nontidal wetlands are present in the vicinity of Site 1 and Site 12. The substantive requirements of this regulation are applicable for the response actions that may affect the integrity of these wetlands
Water Management					
Water resources of the State	Provides for the conservation and protection of the water resources of the State by requiring that any land-clearing grading, or other earth disturbances require an erosion and sediment control plan. Also provides that stormwater must be managed to prevent off-site sedimentation and maintain current site conditions	Activities that affect the water resources of the State	COMAR 04.01 4-101 COMAR 04.01 4-103 COMAR 04.01 4-205 COMAR 04.01 4-206	Applicable	The design for the soil cover installation will incorporate the requirements of this regulation (e.g erosion and sediment control and stormwater management)

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ARARs - Applicable or relevant and appropriate requirements
DON - Department of the Navy

Table D-3
Federal Action-Specific ARARs
Record of Decision for Sites 1 and 12, Patuxent River Naval Air Station

All Action-Specific ARARs are covered by State of Maryland regulations (see Table D-4).

Table D-4
Federal Location-Specific ARARs
Record of Decision for Sites I and 12, Patuxent River Naval Air Station

Action	Requirement	Prerequisite for ARAR to apply	Citation	ARAR Determination	Comments
Maryland Hazardous Waste Regulations					
Storage, treatment or disposal, and transportation of hazardous waste	Regulations and procedures for the identifications, listings, transportation, treatment, storage and disposal of hazardous waste must be met	Handling of hazardous wastes.	COMAR 26.13.02, COMAR 26.13.04, Annotated Code of Maryland Title 7	Applicable	Any hazardous waste found during site remediation will be disposed of according to regulations.
Solid Waste and Water Supply Regulations					
Landfill Closure	Proper closure and post closure monitoring and maintenance of landfills that is protective of the health, welfare, and property of the people of the State of Maryland is required. Specifications for sanitary landfill closure, vegetative stabilization, and gas venting are provided.	Closure and post closure of sanity landfill in the State of Maryland.	COMAR 26.04.07.21 COMAR 26.04.07.22	Relevant and Appropriate	The landfill ceased operation prior to promulgation of Maryland solid waste regulations, but landfill contents are similar to those covered under this regulation. Requirements are relevant and appropriate, with a variance as granted by the State.
Solid Waste and Water Supply Regulations - Variances					
Landfill Closure	A variance from one or more provisions of the solid waste regulations.	A variance can be granted by the State when the design or method of operation proposed in the variance application is to the satisfaction of the State to conserve and protect public health, the natural resources, and the environment of the State, and to control air, water, and land pollution to at least the same extent as would be obtained by compliance with the regulation.	COMAR 26.04.07.26	Applicable	A variance has been granted by the State for construction of a soil cover over the Sites 1 and 12 landfill.
Stormwater Management					
Design and construction	Regulations require the design and construction of a system necessary to control stormwater.	Design and construction	COMAR 26.17.02 COMAR 26.17.02.01 COMAR 26.17.02.03(A&B) COMAR 26.17.02.05 (A) COMAR 26.17.02.06 COMAR 26.17.02.08 COMAR 26.17.02.10	Applicable	The remedial action will not incorporate measures to control and manage stormwater.
Erosion and Sediment Control					
Land clearing, grading, and earth disturbances	Regulations require the preparation and implementation of a plan to control erosion and sediment for activities involving land clearing, and grading and earth disturbances. Erosion and sediment control criteria are also established.	Land clearing, grading, and earth disturbances	COMAR 26.17.01 COMAR 26.17.01.04 COMAR 26.17.01.05 COMAR 26.17.01.07 COMAR 26.17.01.08 COMAR 26.17.01.09 COMAR 26.17.01.11	Applicable	The remedial action will incorporate the standards required for clearing, grading, and other earth disturbances, including compliance with County and Municipal erosion and sediment control ordinances, and the Commission's erosion and sediment control regulations.
Oil Pollution and Tank Management					
Disposal of oil or other matter containing oil	Provides that oil or other matter containing oil may not be discharged, dumped, spilled, drained, thrown, or deposited into, near, or in an area likely to pollute the waters of the State (surface and underground waters within the boundaries of the State, including the Chesapeake Bay and its tributaries, and all ponds, lakes, rivers, streams, public ditches, and public drainage systems within the State other than those designed to collect, convey, or dispose of the sanitary sewer).	Disposal of oil or other matter containing oil.	COMAR 26.10.01.02, Annotated Code of Maryland Title 5	Applicable	The requirements of this regulation will be followed as part of the response action if contractors handle fuel oil or other lubricants onsite.
Air Quality					
Air Emissions	Provide State-adopted, National Ambient Air Quality Standards and Guidelines.	Action that will affect air quality standards.	COMAR 26.11.04	Applicable	Applicable to construction activities relating to the remedial actions.
Visible air emissions	Provides Emission Standards for Visible Air Emissions.	Action resulting in visible air emissions.	COMAR 26.11.06.02 (C.3)	Applicable	Applicable to materials handling or construction activities.

Table D-4
Federal Location-Specific ARARs
Record of Decision for Sites I and 12, Patuxent River Naval Air Station

Action	Requirement	Prerequisite for ARAR to apply	Citation	ARAR Determination	Comments
Particulate air emissions	Provides General Emission Standards, Prohibitions, and Restrictions for particulates.	Action that will result in the emission of particulates.	COMAR 26.11.06.03 (D)	Applicable	Applicable to dust emissions during construction.
Nuisance Control	Prohibits nuisance or air pollution.	Action causing a nuisance, or air pollution.	COMAR 26.11.06.08	Applicable	Applicable to dust emissions during construction.
Odor Control	May not cause or permit the discharge into the atmosphere of gases, vapors, or odors beyond the property line in such a manner that a nuisance on air pollution is created.	Action causing odors, nuisance, or air pollution.	COMAR 26.11.06.09	Applicable	Applicable to construction activities relating to the remedial actions.
Occupational, Industrial, and Residential Hazards					
Action that will generate noise Action that will generate noise (continued)	Limits set on the levels of noise must be met; these limits are protective of the health, welfare, and property of the people in the State of Maryland. The maximum permitted levels for construction activities may not exceed 90 dBA during the day and 75 dBA during night.	Action that will generate noise.	COMAR 26.02.03.02A (2) and B(2), COMAR 26.02.03.02.03A, Annotated Code of Maryland Title 3	Applicable	During the site remediation work, the maximum allowable noise levels will not be exceeded at the Site 1 and Site 12 boundaries.

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ARARs - Applicable or relevant and appropriate requirements
DON - Department of the Navy

Appendix E
Detailed Cost Estimate of the Selected Remedy

Patuxent River Naval Air Station, Sites 1 & 12 Feasibility Study

Alternative 2 - Institutional Controls and Long-term Monitoring; Installation of a Soil Cover over Areas B, and D; Excavation of Debris and Contaminated Sediment from Area C; and Off-Site Disposal

Cost Component	Estimated Quantity	Unit	Unit Cost	Capital Cost
1. Cap Materials (Areas B & D)				
1. Hydroseeding	1,111	MSF	$ 49.00	$ 54,443
2. 6-inch Topsoil/Plantable Soil (Del./Dump)	23,341	CY	$ 8.65	$ 201,900
3. Topsoil backfill, w/dozer, 200hp	23,341	CY	$ 0.81	$ 18,906
4. Controlled Fill				
Excavate/Haul/Dump	214,612	CY	$ 3.10	$ 665,297
Backfill controlled fill, w/dozer, 200hp	214,612	CY	$ 0.81	$ 173,836
Compact controlled fill	214,612	CY	$ 0.41	$ 87,991
5. Clearing (Areas B,D, and F)	11	AC	$ 3,489.00	$ 36,844
6. Testing				
Geotechnical	6	EA	$ 200.00	$ 1,200
Nuclear Density Gage Rental	64	DAY	$ 100,00	$ 6,400
Sampling technician	64	DAY	$ 210.00	$ 13,400
7. Perforated 4-inch Corrugated Plastic Pipe (CPP)	6,036	LF	$ 0.99	$ 5,976
8. Smooth 4-inch CPP	604	LF	$ 0.99	$ 598
9. 4-inch CPP Tee	60	EA	$ 14.05	$ 848
10. Underdrain Stone (Del./Dump)	447	CY	$ 10.00	$ 4,471
Subtotal				$ **1,272,150**
II. Top of Slope Diversions				
1. Controlled Fill	4,471	CY	$ 3.10	$ 13,861
Backfill, w/dozer, 200 hp	4,471	CY	$ 0.81	$ 3,622
Compact	4,471	CY	$ 0.41	$ 1,833
Subtotal				**19,316**
III. Riprap Downchutes				
1. Non-Woven Geotextile	3,169	SF	$ 0.14	$ 444
2. Riprap	176	CY	$ 29.50	$ 5,194
3.Filter Stone (for vehicle access)	59	CY	$ 10.00	$ 587
Subtotal				**6,224**
IV. Drainage Channels				
1. Excavate site soil for channel	3,577	CY	$ 1.35	$ 4,829
Controlled fill	3,577	CY	$ 3.10	$ 11,089
Backfill controlled fill, w/dozer, 200 hp	3,577	CY	$ 0.81	$ 2,897
Compact controlled fill	3,577	CY	$ 0.41	$ 1,467
2. Riprap	4,695	CY	$ 29.50	$ 138,500
3. Filter Stone	1,565	CY	$ 10.00	$ 15,650
4. Non-Woven Geotextile	84,508	SF	$ 0.14	$ 11,831
Subtotal				**186,262**
V. Erosion and Sediment Control				
1. Sediment Traps	6	EA	$ 3,000.00	$ 18,000
2. Temporary Vegetation	7	AC	$ 3,000.00	$ 20,786
3. Silt Fence	6,036	LF	$ 1.42	$ 8,572

Patuxent River Naval Air Station, Sites 1 & 12 Feasibility Study

Alternative 2- Institutional Controls and Long-term Monitoring; Installation of a Soil Cover over Areas B, and D; Excavation of Debris and Contaminated Sediment from Area C; and Off-Site Disposal

Cost Component	Estimated Quantity	Unit	Unit Cost	Capital Cost
4. Stone/Hay Bale Check Dam	20	EA	$ 100,00	$ 2,000
Subtotal				**$ 49,358**
VI. Special Construction				
1. Area C				
Clearing	3	AC	$ 3,489.00	$ 10,467
Excavator	50	HR	$ 124.00	$ 6,200
Haul/Dispose Debris Offsite	350	TON	$ 60.00	$ 21,000
2. Area F				
Hydroseed	441	MSF	$ 49.00	$ 21,626
3. Groundwater Monitoring Well Extension	9	EA	$ 500.00	$ 4,500
4. Shoreline Stabilization	1,000	LF	$ 582.00	$ 582,000
5. Wetlands Mitigation: Areas B & D	2.6	AC	$ 25,000.00	$ 64,739
6. Spread/Compact 6-inch Gravel Surface (Access Road Improvements)	6,667	SY	$ 5.00	$ 33,333
Access Road Woven Geotextile	60,000	SF	$ 0.24	$ 14,400
Subtotal				**758,265**
VII. Landfill Gas Collection Monitoring				
1. Installation of Gas Monitoring Wells	5	EA	$ 3,000.00	$ 15,000
Subtotal				$ 15,000
SUBTOTAL - CUMULATIVE CAPITAL COSTS				**$ 2,310,000**
VIII. General Requirements				
1. Payment & Performance Bonds			2%	$ 46,200
2. Mobilization/Demobilization Heavy Equipment	12	EA	$ 2,500.00	$ 30,000
3. Insurance			2%	$ 46,200
4. Jobsite OH and profit			10%	$ 231,000
Subtotal				**$ 353,400**
TOTAL - CUMULATIVE CAPITAL COSTS				**$ 2,660,000**
Construction Management & Engineering			5%	**$ 133,000**
Health & Safety (Level D)			10%	**$ 266,000**
Contingency			25%	**$ 665,000**

Patuxent River Naval Air Station, Sites 1 & 12 Feasibility Study

Alternative 2 - Institutional Controls and Long-term Monitoring; Installation of a Soil Cover over Areas B, and D; Excavation of Debris and Contaminated Sediment from Area C; and Off-Site Disposal

Cost Component	Estimated Quantity	Unit	Unit Cost	Capital Cost
TOTAL - CAPITAL COSTS				**$ 3,720,000**
IX. Annual Expenses (O&M)				
1. Groundwater Monitoring (annual)				
Cost per Sample, Including Reporting (SL)	22	SL	$2,000	$ 44,000
2. Gas Monitoring				
Cost of Sampling per Well/Structure (W/S)	10	W/S	$50	$ 500
2. Routine Maintenance and Repair				
Mowing	28.9	AC	$25	$ 723
Fertilization	28.9	AC	$50	$ 1,447
Reseeding	28.9	AC	$100	$ 2,894
3. Site Inspection	1	LS	$2,000	$ 2,000
4. Stormwater Management System Maintenance	1	LS	$5,000	$ 5,000
GRAND TOTAL ANNUAL				$ **56,564**
PRESENT WORTH COST				**4,590,000**

Notes:
Construction cost estimates are not discounted because the construction work will be performed in the first year. O&M costs are reported as present worth estimates given a 5% discount rate for a 30 year duration. Cost estimates am based on estimated quantities which may be refined when the remedy is designed. Cost estimates are within +50 to -30% accuracy expectation.
AC = Acre
CY = Cubic Yard
EA = Each
HR = Hour
LF = Linear Foot
LS = Lump Sum
MSF = 1000 Square Feet
SF = Square Feet
SL = Sample
SY = Square Yard
TON = Ton
W/S = Well/Structure